2022

ECONOMIC REVIEW OF CHEMISTRY

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CHEMISTRY INDUSTRY ASSOCIATION OF CANADA

2022

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The Chemistry Industry Association of Canada (CIAC) is the voice of Canada's $64 billion chemistry industry and represents more than 50 members and partners across the country. The industry employs 78,500 Canadians and supports an additional 392,000 jobs in Canada.

Members of CIAC are signatories to Responsible Care®— the association's U.N.— recognized sustainability initiative. Responsible Care® inspires its members to take actions that improve the sustainability of their operations and reduce harm throughout the entire life cycle of their products.

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President's Message

I am pleased to present to you the ***Chemistry Industry Association of Canada's*** (CIAC) **2022 *Economic Review of Chemistry***.

Canada's $64 billion chemical manufacturing industry is a significant contributor to our country's economy. The sector is directly responsible for 78,500 jobs and pays approximately $6.63 billion in salary and wages. Primarily concentrated in Alberta, Ontario and Quebec, the industry supports an additional 392,500 jobs in the overall economy across the country.

2021 saw the continued recovery of the chemistry sector from the impacts of COVID-19. Overall, demand for chemistry was near a record high. 2021 metrics for shipments, exports and wages were all near the highs seen in 2018 and is a reflection of the strong economic recovery taking place. However, like many sectors our recovery has been uneven. Demand for some chemistry products still trails pre-COVID demand while other products have never been in higher demand. 2021 was a year of continued supply chain disruptions in the form of extreme weather, transportation logistical hurdles, increasing energy and feedstock costs and the ongoing impacts of consumer demand reacting to COVID-19. 2021 also saw several major chemistry investment proposals, largely centered on Alberta and Quebec. Taken together, publicly announced chemistry investment proposals exceed $25 Billion. As well, these projects are envisioned as making significant contributions towards a net zero carbon and circular economic future for Canada's chemistry sector. At CIAC, we will be highly focused on working with all levels of government to ensure supporting investment conditions to turn these proposals to final investment decisions and ultimately built infrastructure.

This annual review and the accompanying executive summary provide readers with an economic profile of the industry as well as quantitative insight into the industry's importance to our country's economy, and to all Canadians.

Yours sincerely,

Bob Masterson
President and CEO
Chemistry Industry Association of Canada

Introduction[1]

Using data from Statistics Canada (unless otherwise stated), CIAC's 2022 Economic Review of Chemistry provides a statistical review of various key industry indicators including shipments, imports, exports, and employment from the year 2021. The report also includes a section on specialty chemicals, statistics for the key provinces of Quebec, Ontario and Alberta, and for the segments of the industry of primary interest to CIAC members.

This report is prepared by the Association's Business and Economics (B&E) team. The B&E team provides ongoing economic analysis of government policy initiatives, business trends and changing industry dynamics.

Industrial Classification

Industries in Canada are classified according to the 2012 North American Industrial Classification System (NAICS). This classification is maintained by Statistics Canada and its counterpart organizations in the United States and Mexico. The chemical manufacturing subsector is captured in NAICS 325 which comprises establishments primarily engaged in manufacturing chemicals and chemical products, from organic and inorganic raw materials.

NAICS 325 includes the following sub-industry groups:

- Basic chemicals (NAICS 3251)
- Synthetic resins, rubbers, and synthetic fibres (NAICS 3252)
- Pesticides and fertilizers (NAICS 3253)
- Pharmaceuticals (NAICS 3254)
- Paints, coatings and adhesives (NAICS 3255)
- Soaps, cleaning compounds and toilet preparations (NAICS 3256)
- Other chemical products (NAICS 3259)

This report focuses on statistics for the overall chemical industry (NAICS 325), and for the combination of NAICS 3251 and 3252 which are collectively referred to as industrial chemicals.

- NAICS 3251 Basic chemicals - comprises establishments primarily engaged in manufacturing organic and inorganic chemicals, using basic processes such as thermal cracking, distillation, and chemical reaction.
- NAICS 3252 Synthetic resins, rubbers, and fibres— comprises establishments primarily engaged in manufacturing polymers such as polyethylene, polypropylene, butyl rubbers, polyamides, and fibres made from these resins. Polymerization of monomers into polymers, for example, ethylene into polyethylene, is the basic process.

[1] This publication intends to provide the best information available. However, neither CIAC nor its employees make any warranty, expressed or implied, or assumes any liability or responsibility for any use, or the results of such use, of any information or data disclosed in this report.

For more information about this report:

David Cherniak
Policy Manager, Business and Economics
dcherniak@canadianchemistry.ca
(613) 237-6215 ext. 231

Greg Moffatt
VP Policy and Corporate Secretary
gmoffatt@candianchemistry.ca
(613) 237-6215 ext. 230

Chemistry Industry at a Glance

Chemical industry[2] shipments in Canada in 2021 were $64 billion, exports were $41.7 billion, and imports totaled $72.9 billion.

The industry employed 78,500 workers in 2021 which constituted six per cent of all manufacturing jobs in Canada. In addition to the direct jobs, other jobs are supported by the purchasing activity of the chemistry industry and by the subsequent expenditure-induced activity. CIAC has estimated that for every job in the chemistry industry, another 5 indirect jobs are created in other parts of the economy, so in total the chemistry industry supports 392,000 jobs in Canada.

Industrial chemicals are a keystone industry within the Canadian economy. It converts and adds value to raw resources such as natural gas, crude oil, minerals, metals and biomass, creating intermediate products that are used as inputs by other parts of the chemistry industry, and by almost all other manufacturing segments. Major consumer industries include: plastic and rubber products (NAICS 326), forest products (NAICS 321 and 322), transportation equipment (NAICS 336), oil and gas extraction (NAICS 211), clothing (NAICS 315), construction (NAICS 23), and pharmaceuticals (NAICS 3254). For industrial chemicals, shipments in 2021 were $29.3 billion, exports were $22.3 billion, imports were $22.1 billion, and employment was 17,700 indirectly supporting 88,500 jobs in the broader Canadian economy.

Table 1: Principal Statistics for the Chemical Industry

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Shipments, $ billion	47.1	48.6	49.7	52.2	51.6	51.3	52.9	56.0	53.3	64.4
Employment, 000	83.6	83.9	84.3	86.4	84.3	86.6	85.8	86.4	81.8	78.5
Imports, $ billion	44.4	46.4	50.3	53.7	53.3	55.8	59.8	61.8	62.3	72.9
Exports, $ billion	29.6	32.0	35.5	36.2	35.9	33.7	38.0	37.4	36.0	41.6



Table 2: Principal Statistics for the Industrial Chemical Sector

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Shipments, $ billion	24.7	25.5	26.1	25.4	24.1	26.2	28.9	26.0	22.4	29.3
Employment, 000	17.2	17.4	17.5	17.7	15.7	16.4	16.4	15.8	14.9	17.7
Imports, $ billion	17.3	17.9	19.3	19.7	18.8	19.8	21.3	20.8	20.0	22.1
Exports, $ billion	17.0	18.7	19.8	19.2	18.7	18.7	20.6	18.4	16.5	22.3

[2] Chemical industry and industrial chemicals are defined on page 1.

Manufacturing Shipments (Revenue)

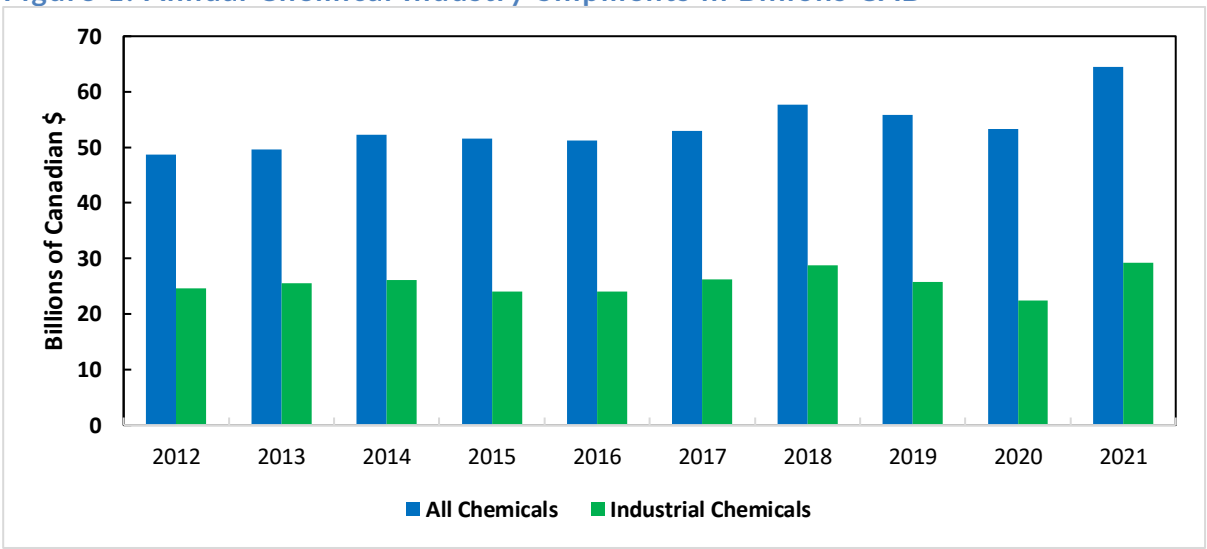
In 2021, Canada's chemical industry manufactured $64.4 billion worth of products an increase of 20.8 per cent compared to 2020.

Shipments of industrial chemicals were $29.3 billion in 2021, representing an increase of 30.8 per cent compared to 2020 (Table 3, Figure 1). The value of shipments for industrial chemicals declined broadly last year owing to the COVID-19 pandemic.

Table 3: Manufacturing Shipments

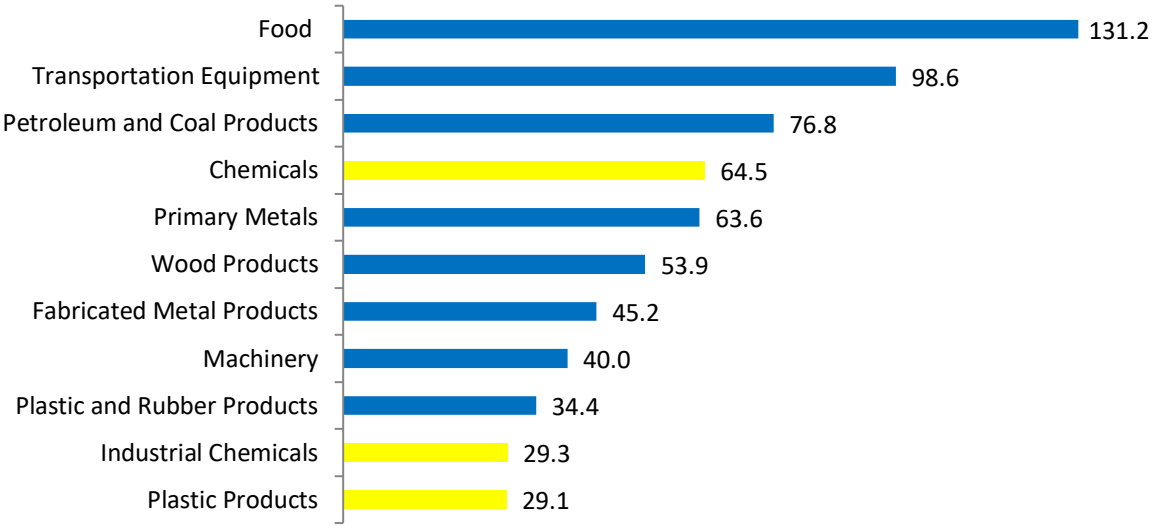
Manufacturing Shipments, $ Billion	2020	2021	Change 2020-21
All chemicals	53.3	64.4	20.8%
Industrial chemicals	22.4	29.3	30.8%

Figure 1: Annual Chemical Industry Shipments in Billions CAD



Within the NAICS system, there are 21 manufacturing industries at the 3-digit level. Among these industries, chemicals (NAICS 325) ranks as the 4th largest based on value of shipments (Figure 2).

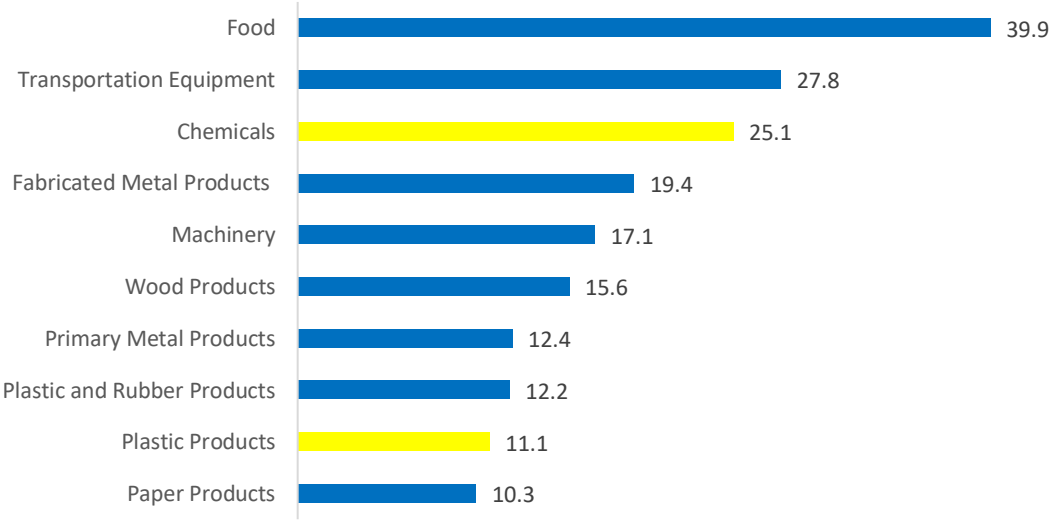
Figure 2: Top 10 Manufacturing Industries by Value of Shipments, $ Billions



Value Added

Value added measures the value of output of an industry less the value of intermediate inputs required in the production process. Compared to all manufacturing industries, chemicals ranked 3rd based on value added in 2020 (latest available, Figure 3).

Figure 3: Top 10 Manufacturing Industries by Value Added



Employment

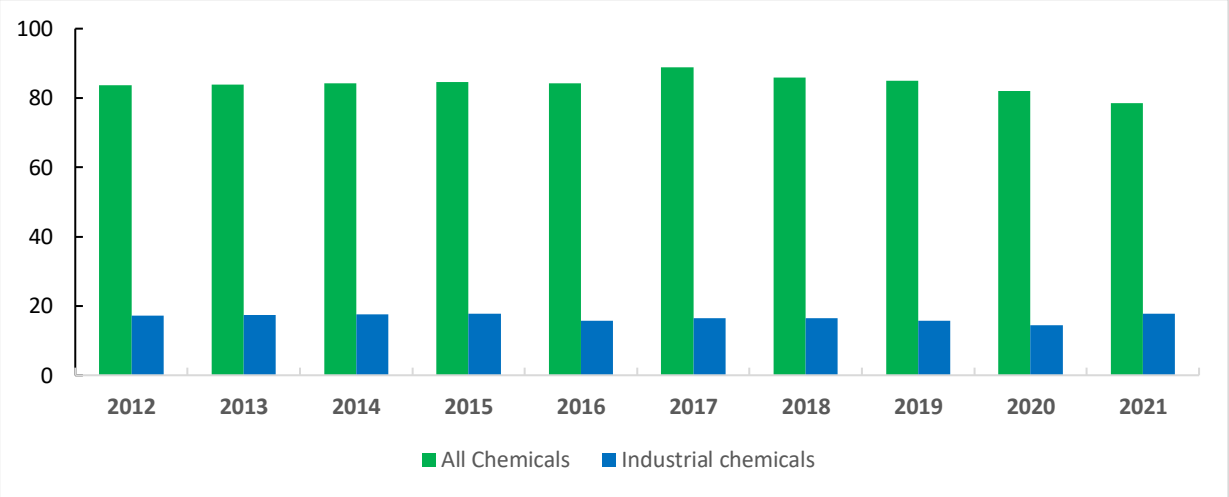
The chemical industry employed 78,500 workers in 2021. For industrial chemicals, the figure was 17,400. For both groupings, employment peaked in 2003 and has tended to decline since, although levels have been mostly flat in recent years (Table 4 and Figure 4). COVID-19 has caused fluctuations in employment the last two years, and we now have a better picture of sector employment as we return to normal

In addition to the direct jobs, additional jobs are supported by the purchasing activity of the chemical industry and by the subsequent expenditure-induced activity. For every job in the chemical industry, it is estimated that another five jobs in other sectors are indirectly linked to the industry. On this basis, the chemical industry supports about 392,500 jobs— industrial chemicals about 87,000 - in the overall Canadian economy.

Table 4: Employment in the Canadian Chemical Industry

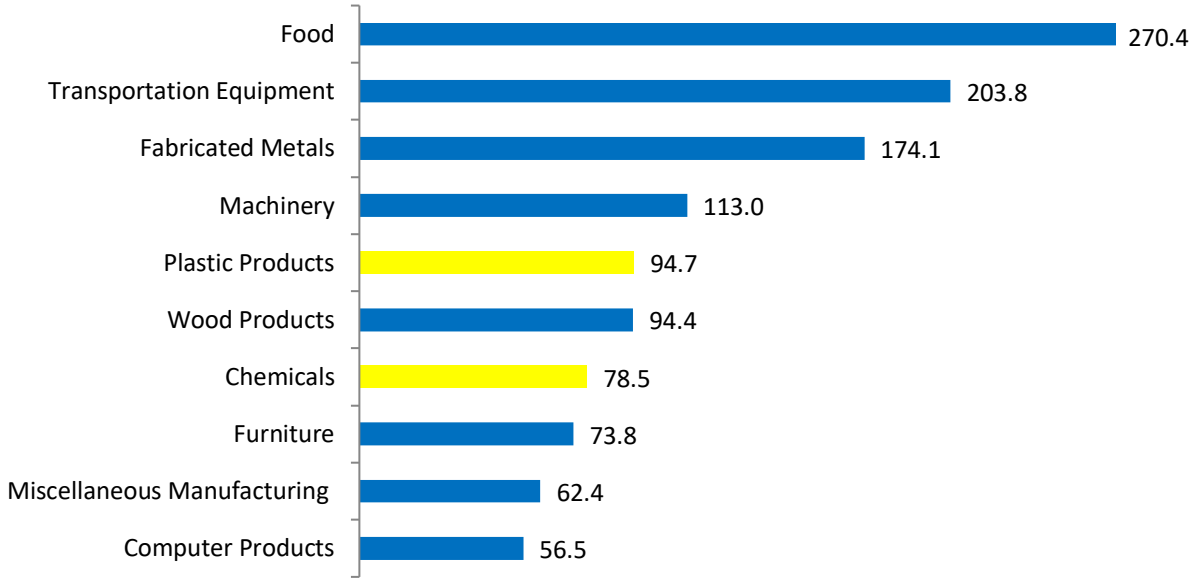
Total Employment, Thousands	2020	2021	Change 2020-2021
All Chemicals	82.1	78.5	-4.3%
Industrial Chemicals	14.4	17.4	20.8%

Figure 4: Chemical Industry Employment



On the basis of employment, chemicals rank 7th among all manufacturing industries (Figure 5). Plastic Products manufacturing employed 89,700 Canadians and ranked 5th among manufacturing industries.

Figure 5: Top 10 Manufacturing Industries by Employment (in Thousands of People)



Salaries and Wages

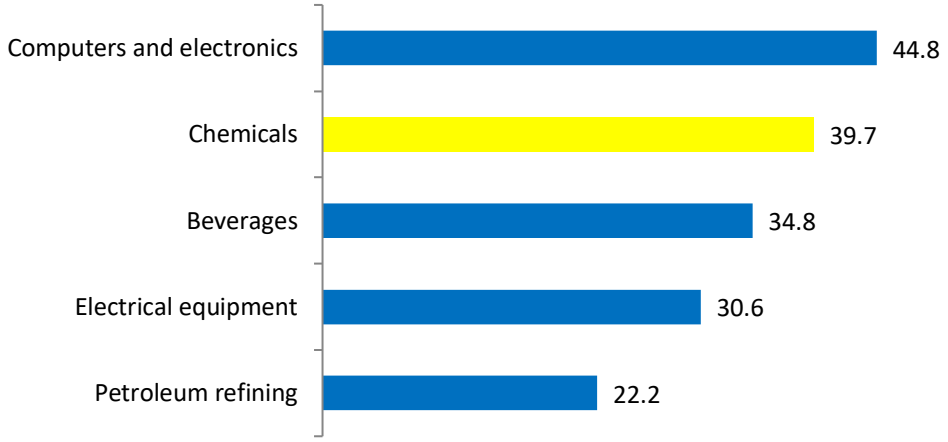
Total salaries and wages paid to employees in the chemical industry in 2021 were $6.63 billion, with $1.53 billion paid in the industrial chemical segment (Table 5). 2021 saw gains in wages and salaries paid in both the overall chemical sector and the Industrial Chemicals sub-sector.

Table 5: Total Salary and Wages Paid by the Chemical Industry

Total Salaries and Wages, $ Billion	2020	2021	Change 2020-21
All Chemicals	6.31	6.63	5.1%
Industrial Chemicals	1.42	1.53	7.0%

Chemical companies operate a variety of types of complex equipment and processes using sophisticated computer control technologies. Employees require specialized education and training to operate these processes safely and efficiently. As a result, the chemical industry's proportion of employees with a university degree (39 per cent) is second only to the computer and electronic products industry (Figure 6), and chemicals has the highest proportion of employees with post-graduate degrees.

Figure 6: Top 5 Manufacturing Industry by Proportion of Employees with a University Degree



Chemicals ranked 2nd among all manufacturing industries with an average salary of $84,500 (Figure 7). **Within industrial chemicals the average salary was higher at $86,120. For overall manufacturing, the average salary in 2021 was $57,870.**

Figure 7: Top 10 Manufacturing Industries Based on Average Earnings Per Employee in Thousands of CAD

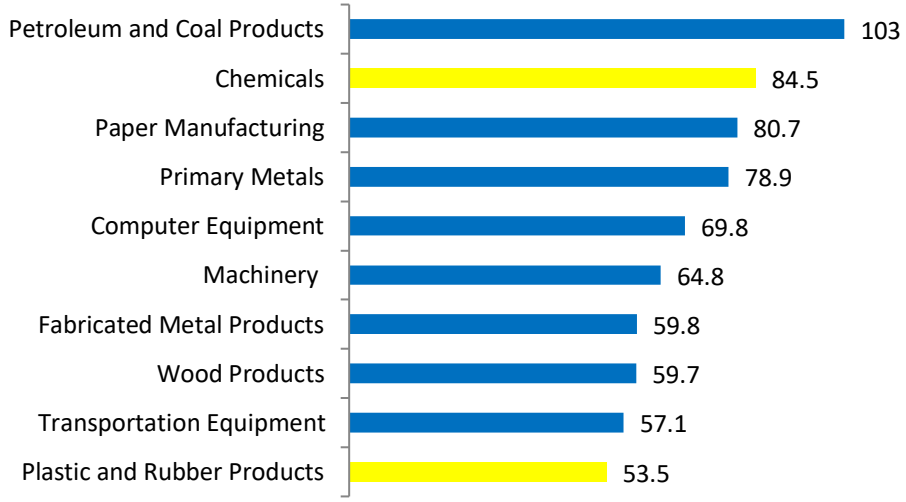


Table 6: Average Salaries in the Chemical Industry

Average Salaries and Wages, $ Thousand	2020	2021	Change 2020-21
All Chemicals	76.9	84.5	9.8%
Industrial Chemicals	99.0	96.5	-2.5%

International Trade

Canada exported $41.7 billion worth of chemicals and chemical products to the world in 2021, a 15.8 per cent increase compared to 2020. Imports increased by 16.9 per cent to $72.9 billion (Table 7 and Figure 8) driven by a recovery in demand for all sub-sectors. The United States represents the dominant export market and the dominant source of imports. In 2021, 77 per cent of exports, worth $32.3 billion went to the United States and 55 per cent of imports worth $34 billion originated there. The next largest export markets are China (3.6 per cent), followed by Japan (2.4 per cent). The next largest sources of imports were Germany (6 per cent), China (5 per cent), followed by Switzerland (3.9 per cent) and Ireland (2.8 per cent each).

For industrial chemicals, Canadian exports increased by 25.4 per cent to $22.3 billion in 2020. Imports also increased, by 10.3 per cent to $22.1 billion (Table 7 and Figure 9). Both imports and exports of industrial chemicals are dominated by bulk commodities like polyethylene, ethylene glycol and styrene.[3] Again the United States is the primary trading partner with 81 per cent of exports worth $17.4 billion and 6 per cent of imports worth $16.6 billion. The next largest export markets were: China $1.2 billion (7 per cent) and Mexico $380 million (2 per cent). The next largest import source partners were: China $2.06 billion (8.1 per cent) and Germany $680 million (3 per cent).

Table 7: Trade in the Chemistry Industry

Value of Trade, $ Billion		2020	2021	Change 2020-21
All Chemicals	**Imports**	62.4	72.9	16.9%
	Exports	36.0	41.7	15.8%
Industrial Chemicals	**Imports**	20.0	25.4	10.6%
	Exports	17.8	21.5	30.3%

[3] For further analysis of the trade of specific industrial chemicals see the Industry Profiles section beginning on page 37 of this report.

Figure 8: Trade of All Chemicals in Billions of CAD

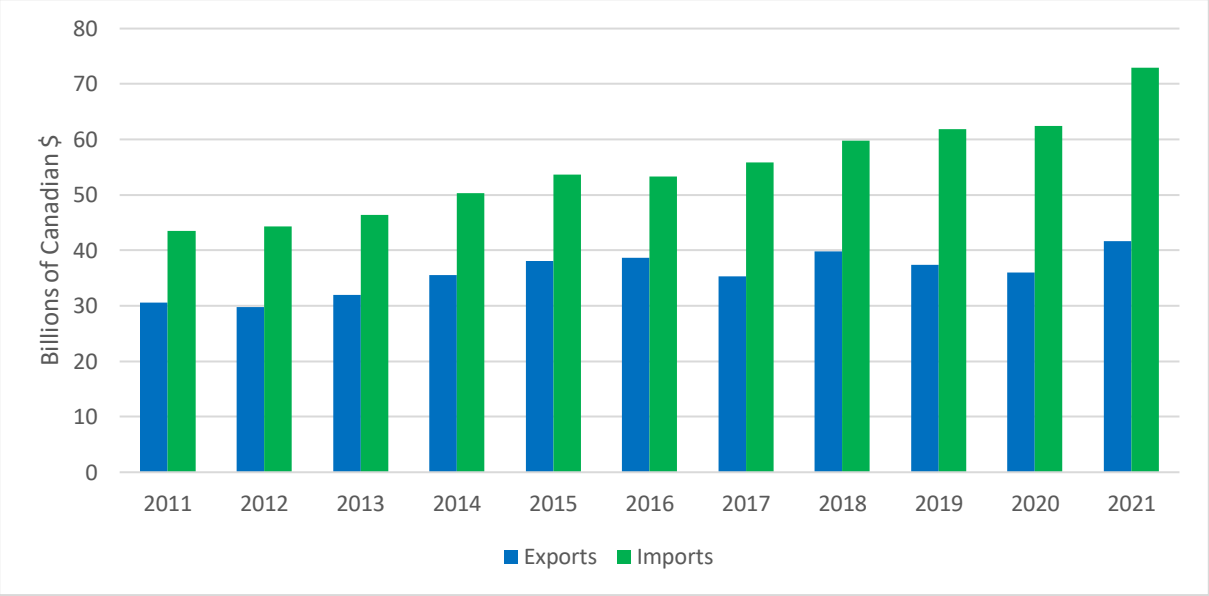
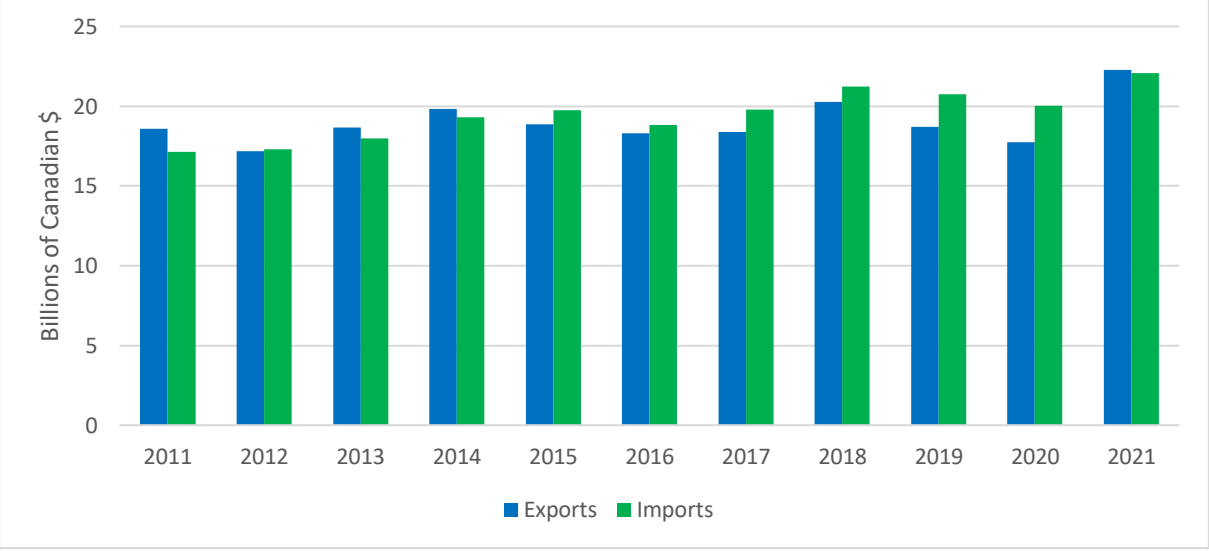
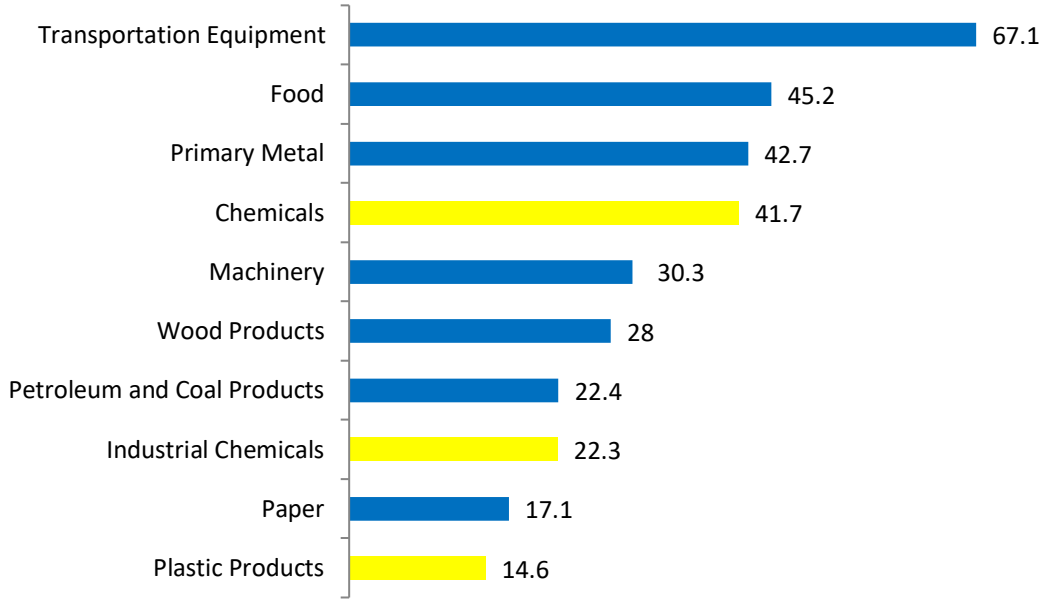


Figure 9: Trade of Industrial Chemicals in Billions of CAD



The chemistry industry was the 4th largest exporter among all manufacturing industries in 2021. (Figure 10)

Figure 10: Top 10 Manufacturing Industries by Exports in Billions of CAD



Profits

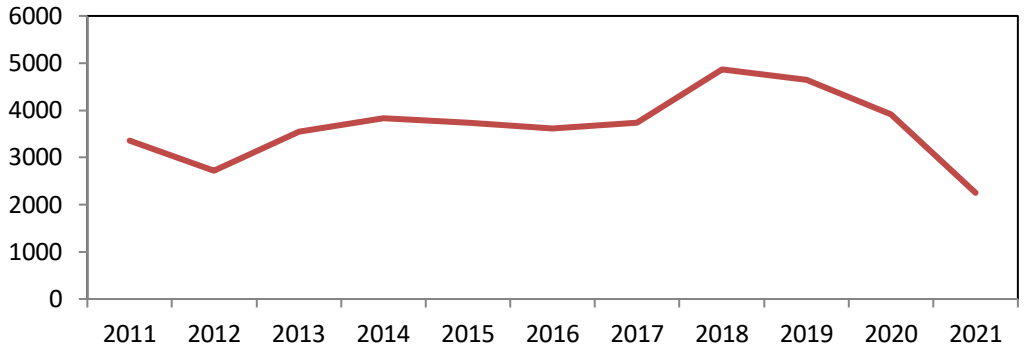
Profits for the chemical sector depend on factors such as capacity utilization, energy and raw material costs, supply-demand balance and competition with foreign producers. Operating profits in 2021 for the chemical industry were $4.3 billion and $2.3 billion for industrial chemicals (Table 8).

Table 8: Operating Profits in the Chemical Industry

Operating profit, $ billion	2020	2021	Change 2020-21
Total chemicals	10.3	4.3	-50.2%
Industrial chemicals	3.9	2.3	-42.5%

Operating profits for industrial chemicals have shown a resilience following the Great Financial Crisis however, the multi-year impacts of the COVID-19 pandemic have hit profitability in the sector.

Figure 11: Operating Profits for Industrial Chemicals, in Millions of CAD



Productivity

One measure of manufacturing productivity is the value of revenue per employee. For all chemicals, output per employee in 2021 was $821,000. For industrial chemicals, it rises to $1.65 million. Output per employee is much higher for industrial chemicals reflecting the capital-intensive nature of the industry compared to chemicals overall. Both numbers have remained largely flat over the past decade.

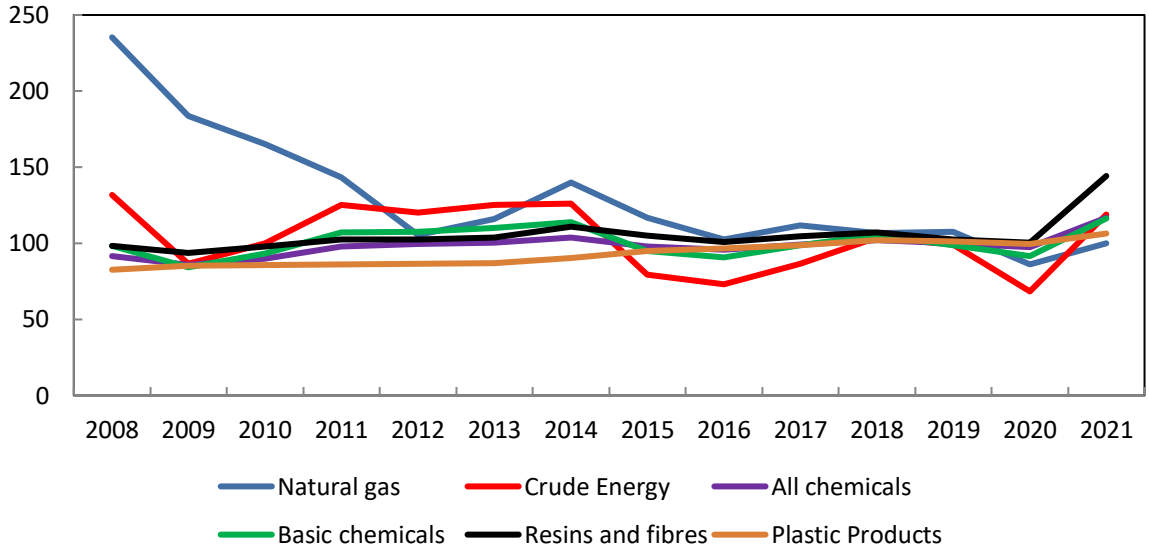
Table 9: Productivity

Output per employee, $ thousand	2020	2021
All chemicals	635	821
Industrial chemicals	1,500	1,650

Price Index

The Industrial Product Price Index (IPPI) reflects the prices that producers in Canada receive as the goods leave the plant. Natural gas and crude oil are two important sources of feedstocks for the chemical industry (see Figure 12). Natural gas is the dominant feedstock in North America and prices have trended mostly downward since 2008 as supply from domestic and U.S. shale production overwhelmed demand. Recent additions of LNG export capacity in the U.S. have increased North American exposure to world prices, similar to crude oil. Crude oil prices fell hard in 2014 and have remained rangebound since a minor recovery in 2015. The COVID-19 pandemic saw crude oil and natural gas prices decline significantly in 2020. 2021 saw a strong rebound in energy prices and demand returned in earnest while supply has lagged. 2021 saw a significant jump in energy prices as shortages in key energy products began emerging in Europe and Asia.

Figure 12: Price Index, 2020=100

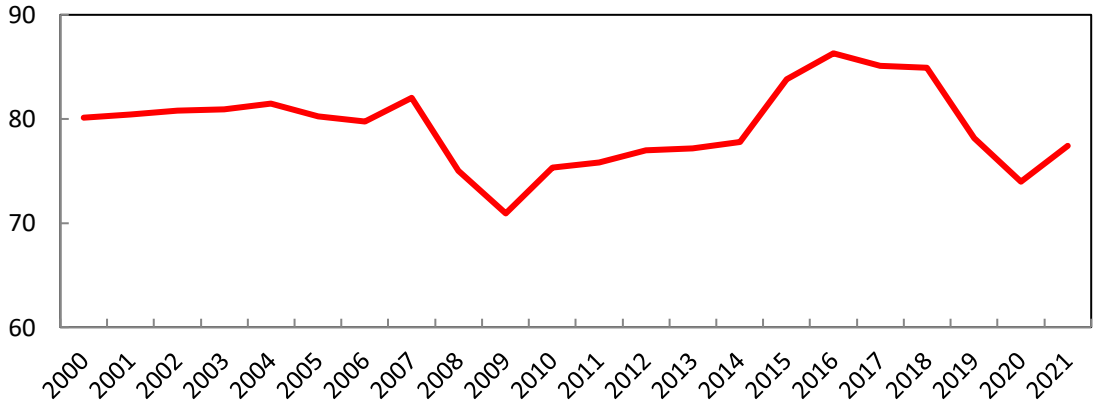


Capacity Utilization

Capacity utilization refers to the extent to which an industry uses its installed productive capacity (Figure 13). Thus, it compares actual output with the maximum potential output that could be achieved if all capacity was fully used.

Capacity utilization for the overall chemical industry hit an all-time low of 68 per cent in the 1st quarter of 2009. Since 2009 capacity utilization has trended upward, and averaged 85 per cent in 2017-2019. The COVID-19 pandemic caused a sharp drop in utilization in 2020 and the recovery back to pre-COVID trend continues with the chemical sector achieving a 77 per cent in 2021. While separate data is not available for industrial chemicals, it would be expected to have utilization rates higher than the industry average since continuous production processes are employed, whereas the segment of the industry producing formulated products relies on batch processes.

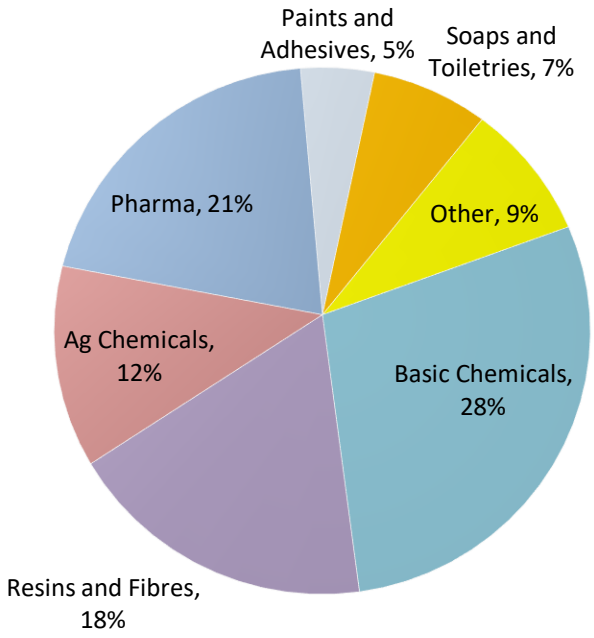
Figure 13: Capacity Utilization in the Chemical Industry, %



Other Chemical Manufacturing Subsectors

As mentioned previously, the Canadian chemical industry is comprised of seven sub-industries. Figure 14 shows the relative size of these industries by shipment value in 2021. Industrial chemicals accounted for 46 per cent of the total industry.

Figure 14: Distribution by Chemical Sub-Industries Based on Shipments



While NAICS 3251 and 3252 are the focus of this report, the following tables provide some data on the other sub-industries.

Table 10: Principal Statistics for Pesticides, Fertilizers and Other Agricultural Chemicals (NAICS 3253)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2013	4,783	5,247	3,101	1,951
2014	5,279	5,259	3,358	1,715
2015	5,406	5,271	3,576	2,057
2016	5,413	5,722	3,398	1,891
2017	6,181	5,722	3,991	1,485
2018	5,536	5,914	3,969	1,327
2019	6,099	5,598	4,034	1,393
2020	6,272	4,882	4,013	1,424
2021	7,750	5,090	5,076	1,997

Table 11: Principal Statistics for Pharmaceuticals (NAICS 3254)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2013	8,549	31,325	13,706	6,054
2014	10,055	30,833	15,387	8,301
2015	9,834	30,356	16,852	10,468
2016	11,670	29,917	17,228	11,759
2017	12,068	31,788	17,630	8,890
2018	12,255	31,124	19,502	11,003
2019	12,911	31,310	19,502	11,221
2020	13,796	31,998	22,592	11,662
2021	13,020	30,718	26,703	10,689

Table 12: Principal Statistics for Paints, Coatings and Adhesives (NAICS 3255)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2013	2,672	7,788	1,902	528
2014	2,778	8,196	2,055	596
2015	2,619	8,593	2,322	694
2016	3,342	8,216	2,434	763
2017	3,203	7,773	2,373	769
2018	3,122	6,725	2,459	835
2019	3,185	7,141	2,563	864
2020	3,057	6,136	2,442	783
2021	2,982	6,420	2,599	863

Table 13: Principal Statistics for Soaps, Cleaning Compounds and Toilet Preparations (NAICS 3256)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2013	4,439	11,412	4,934	2,665
2014	4,200	11,503	5,312	2,907
2015	4,433	11,769	6,072	3,334
2016	4,911	13,946	6,400	3,063
2017	4,821	14,018	6,581	3,065
2018	5,149	15,384	6,818	3,439
2019	4,911	14,437	7,025	3,365
2020	4,673	13,113	7,815	3,323
2021	4,706	12,536	7,069	3,500

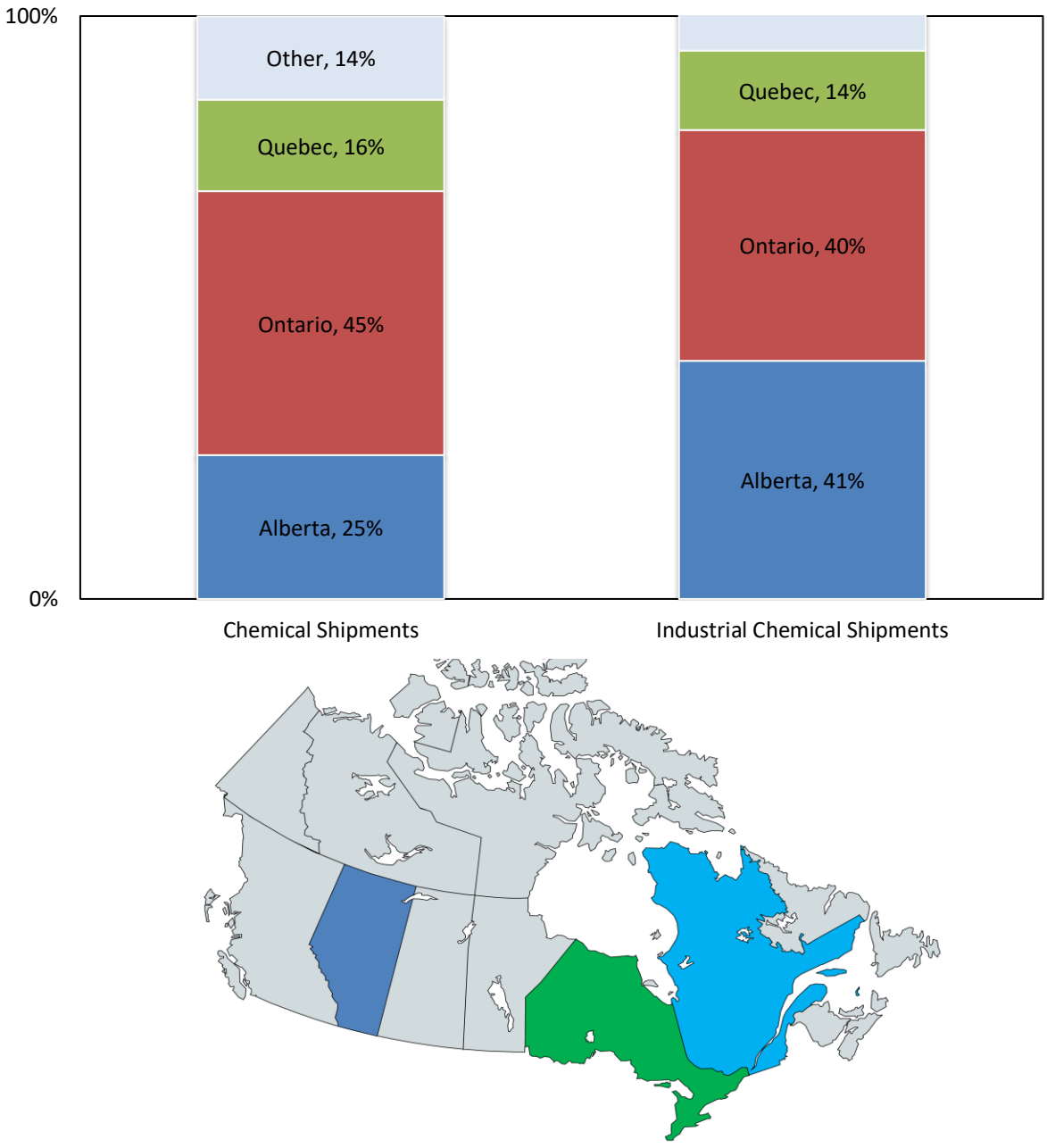
Table 14: Principal Statistics for Other Chemical Products (NAICS 3259)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2013	4,698	10,800	4,798	2,055
2014	4,813	10,854	4,889	2,179
2015	4,932	10,905	5,147	2,161
2016	5,622	10,837	5,016	1,983
2017	5,284	10,660	5,410	1,965
2018	5,922	10,587	5,710	2,076
2019	6,140	12,230	5,894	2,147
2020	5,543	11,151	5,467	2,350
2021	5,488	11,667	6,117	3,148

Provincial Statistics

Both the overall chemical industry and the industrial chemicals segment are concentrated in the provinces of Ontario, Alberta and Quebec (Figure 15). Further information about these three main provinces is contained in the following portions of the analysis.

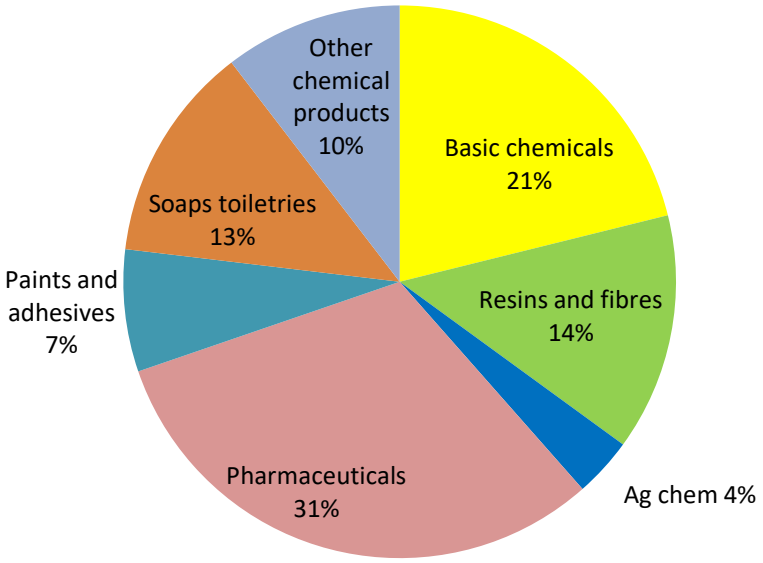
Figure 15: Provincial Distribution of the Chemical Industry, by Value of Shipments



a. Ontario

In 2021, Ontario's chemical industry had shipments of $29.2 billion an increase of 18.3 per cent from 2020. Industrial chemical shipments totaled 11.6 billion in 2021 an increase of 39.3 per cent from 2020 (Figure 16).

Figure 16: Composition of the Ontario Chemical Industry



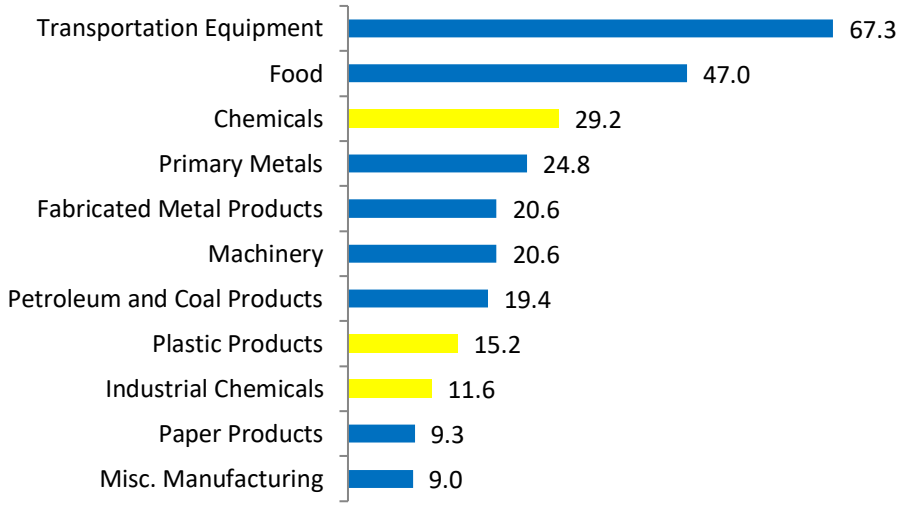
The largest cluster for the industrial chemical industry is in the Sarnia region, with the next largest concentrations in the Golden Horseshoe and along the St. Lawrence Seaway.

Table 15: Ontario Chemical Industry Shipments

Shipments, $ billion	2020	2021	Change 2020-21
All chemicals	24.6	29.2	18.3%
Industrial chemicals	8.3	11.6	39.3%

On the basis of shipments, Chemicals was the 3rd largest of all manufacturing industries in the province in 2021 (Figure 17).

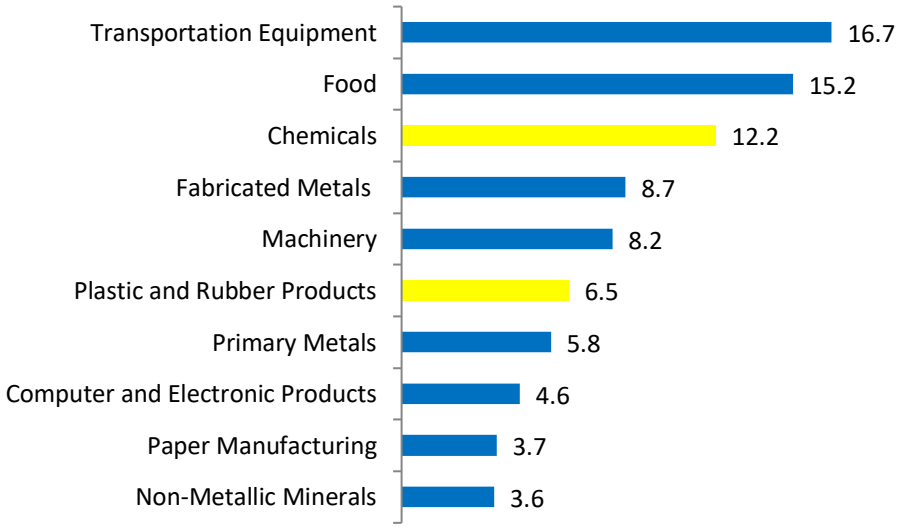
Figure 17: Top 10 Manufacturing Industries in Ontario by Value of Shipments, $ Billion



• Value Added

On the basis of value added, chemicals also ranked 3rd among all manufacturing industries in 2020 (latest data available) (Figure 18).

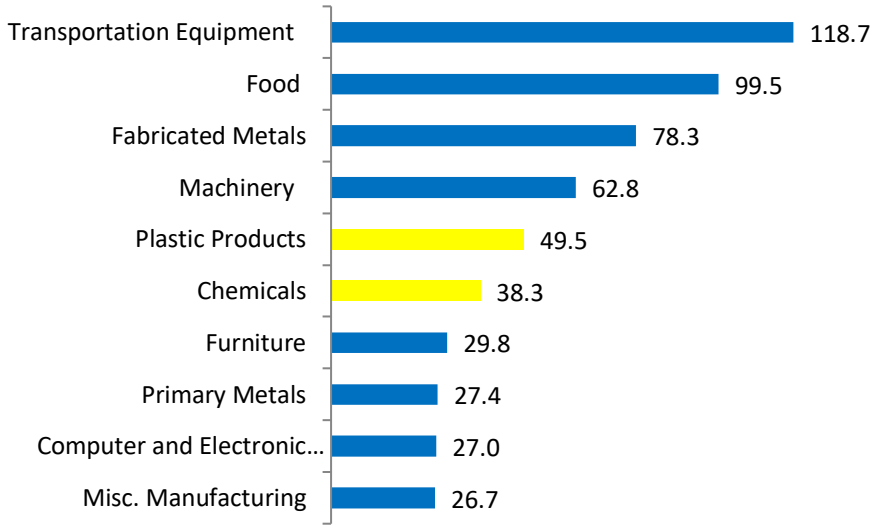
Figure 18: Top 10 Industries by Value Added in Ontario, $ Billion



• Employment Ranking

The chemical industry directly employed 38,300 people in Ontario in 2021, a decline of 8.4 per cent from 2020. When indirect employment is included, it is estimated that the chemical industry supports almost 191,500 jobs in the province. The number of employees working in industrial chemicals was 8,319 a 19.4 per cent increase from 2020. The industrial chemical sector supports almost 41,4600 jobs in the province. When compared to other manufacturing industries, chemicals ranked 6th on the basis of employment (Figure 19).

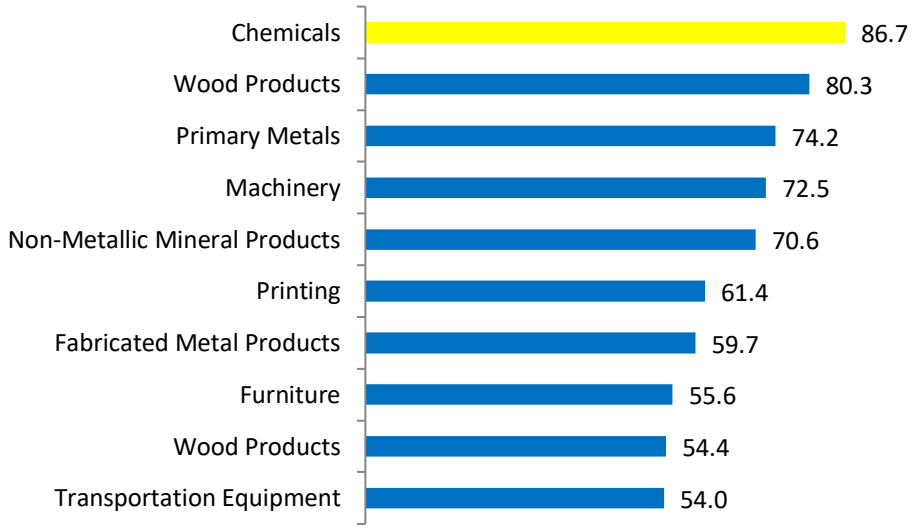
Figure 19: Top 10 Manufacturing Industries by Number of Employees in Ontario in Thousands



• Salaries and Wages

The chemical industry paid a total of $3.32 billion in salaries and wages in the province in 2021. With an average annual salary of $86,720, the industry ranked 1st among all manufacturing industries in Ontario (Figure 20). **The average salary within industrial chemicals was $82,440. The average salary across all manufacturing industries in Ontario was $59,500**.

Figure 20: Top 10 Manufacturing Industries by Average Salary in Ontario in $ Thousands



Trade

The value of exports by the chemical industry from Ontario in 2021 was $12.6 billion, while imports were $49.5 billion (Table 16). The United States was the destination for 74 per cent of exports, followed by Japan (3.6 per cent), the United Kingdom (3.3 per cent) and China (3 per cent). The United States was also the source for most of the imports (64 per cent), followed by Germany (5.9 per cent) and Switzerland (5.3 per cent each).

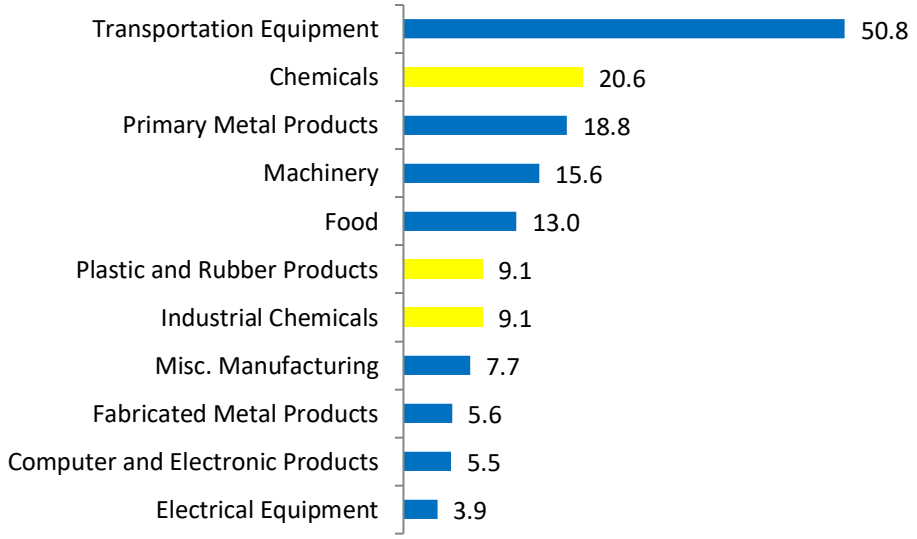
For industrial chemicals, exports from the province in 2021 were $9.06 billion, while imports were $16.1 billion. The United States was the destination for 79 per cent of exports, followed by United Kingdom (5.4 per cent) and Germany (2.6 per cent). The United States was also the source of most of the imports (78 per cent), followed by China (5.5 per cent).

Table 16: Trade by the Chemical Industry in Ontario

Value of trade, $ billion		2020	2021	Change 2020-21
All chemicals	**Imports**	43.1	49.5	14.8%
	Exports	18.7	20.6	10.2%
Industrial chemicals	**Imports**	12.8	16.1	25.8%
	Exports	6.8	9.06	33.2%

Chemicals is the 2nd largest exporter among all manufacturing industries (Figure 21).

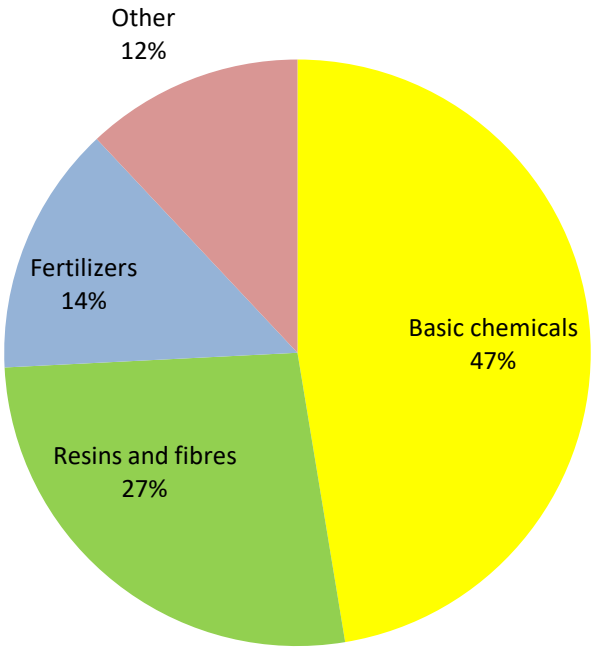
Figure 21: Top 10 Manufacturing Industries by Value of Exports from Ontario, $Billions



b. Alberta

In 2021, Alberta's chemical industry had shipments of $15.9 billion (Table 17). Industrial Chemicals represent 74 per cent of the total (Figure 22), with $12 billion in shipments in 2022.

Figure 22: Composition of the Alberta Chemical Industry



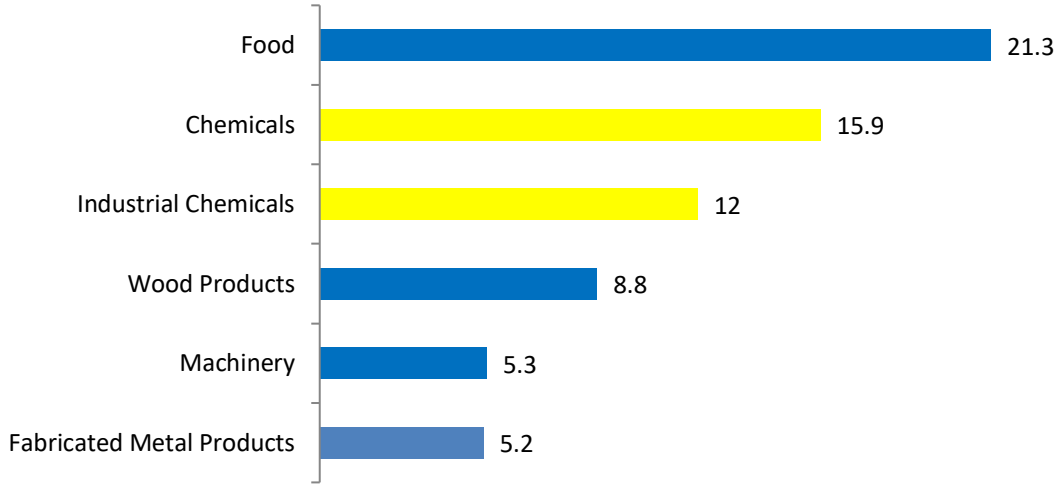
The industrial chemical industry in Alberta is located in the Industrial Heartland region northeast of Edmonton, in central Alberta, near Red Deer, in Medicine Hat, and growing in size and scope near Grande Prairie.

Table 17: Alberta Chemical Industry Shipments

Shipments, $billion	2020	2021	Change 2020-21
All chemicals	12.7	15.9	25.2%
Industrial chemicals	9.5	12	26.1%

Based on value of shipments Chemicals ranked 2nd among all manufacturing industries in the province in 2021 (Figure 23).

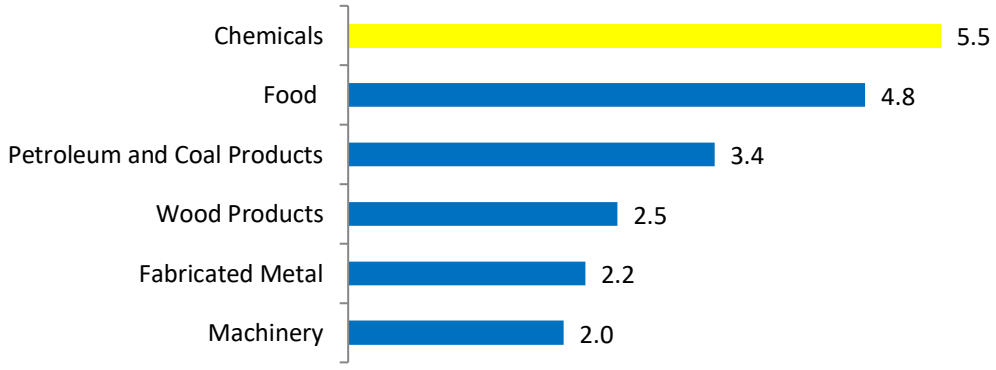
Figure 23: Top 5 Manufacturing Industries in Alberta by Value of Shipments, $Billion [4]



• Value Added

Based on value added, chemicals ranked 1st among all manufacturing industries (Figure 24) based on 2020 data (latest available).

Figure 24: Top 5 Industries by Value Added in Alberta, $ Billion

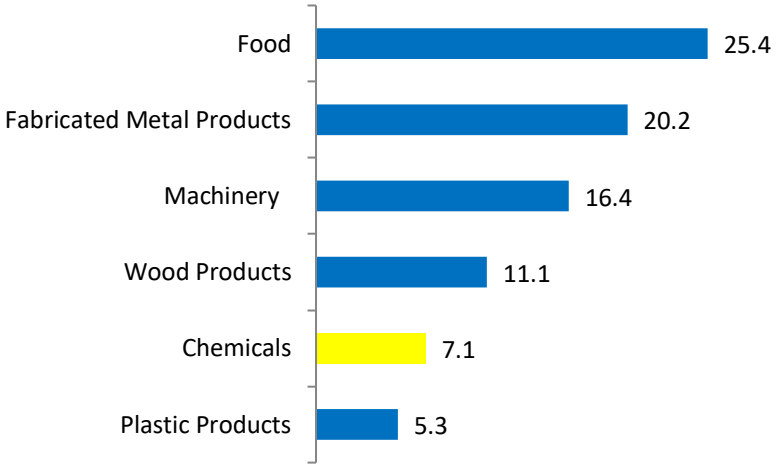


[4] The top 10 industries cannot be ranked because data for many industries has been suppressed by Statistics Canada.

Employment Ranking

The chemical industry employed 7,121 people in Alberta in 2021, an increase of 5.6 per cent compared to 2020. When indirect employment is included, it is estimated that the chemical industry supports about 35,605 jobs in the province. The number of employees working in industrial chemicals in 2021 was 2,973 indirectly supporting over 14,860 jobs in the province. When compared to other manufacturing industries in the province, chemicals ranked 5th (Figure 25).

Figure 25: Top 5 Manufacturing Industries by Employment in Alberta



Salaries and Wages

The chemical industry paid a total of $779 million in salaries and wages in the province in 2021. The average salary paid to employees in the chemical industry was $109,520, which ranked 1st among all manufacturing industries (Figure 26). **The average salary within industrial chemicals was $140,000.**

Figure 26: Top 5 Manufacturing Industries by Average Salary in Alberta, $ Thousands

Trade

The value of exports by the chemical industry from Alberta in 2021 was $7.1 billion, while imports were $2.9 billion (Table 18). The United States was the destination for 81 per cent of exports, followed by China (8 per cent) and Mexico and Singapore (2 per cent each). The United States was also the source of most imports (81 per cent), followed by China (6 per cent), Belgium (2 per cent) and Germany (2 per cent).

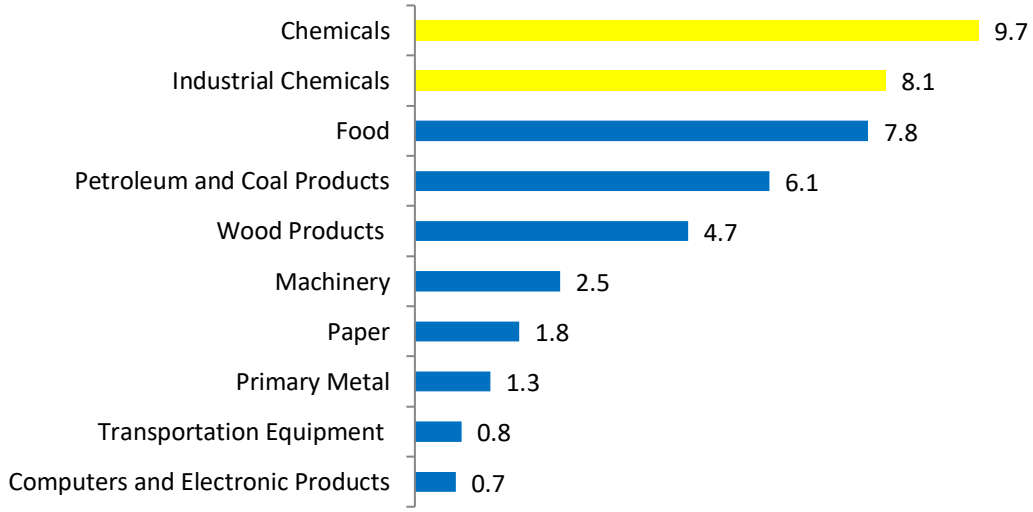
For industrial chemicals, exports from the province in 2021 were $8.1 billion, while imports were $1.9 billion. The United States was the destination for 86 per cent of exports, followed by United Kingdom (5 per cent) and Germany (3 per cent). The United States was the source of most imports (80 per cent), followed by China (9 per cent), and Italy (2 per cent).

Table 18: Trade by the Chemical Industry in Alberta

Value of trade, $ billion		2020	2021	Change 2020-21
All chemicals	**Imports**	2.6	3.6	38.9%
	Exports	7.1	9.7	35.7%
Industrial chemicals	**Imports**	1.3	1.9	43.1%
	Exports	6.1	8.1	32.9%

Chemicals ranks 1st among manufacturing industries in terms of exports from Alberta (Figure 27). Considering all commodities, chemicals ranked 3rd behind only crude oil and natural gas.

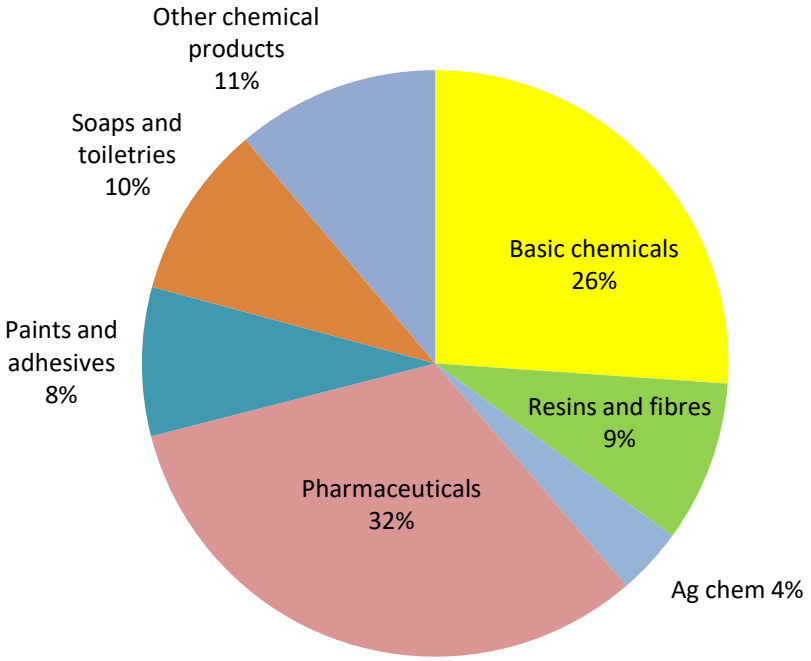
Figure 27: Top 10 Manufacturing Industries by Value of Exports from Alberta, $ Billion



c. Quebec

In 2021, Quebec's chemical industry had shipments of $10.1 billion an increase of 9.9 per cent from 2020. Industrial chemicals accounted for 38 per cent of the total (Figure 28).

Figure 28: Composition of the Quebec Chemical Industry



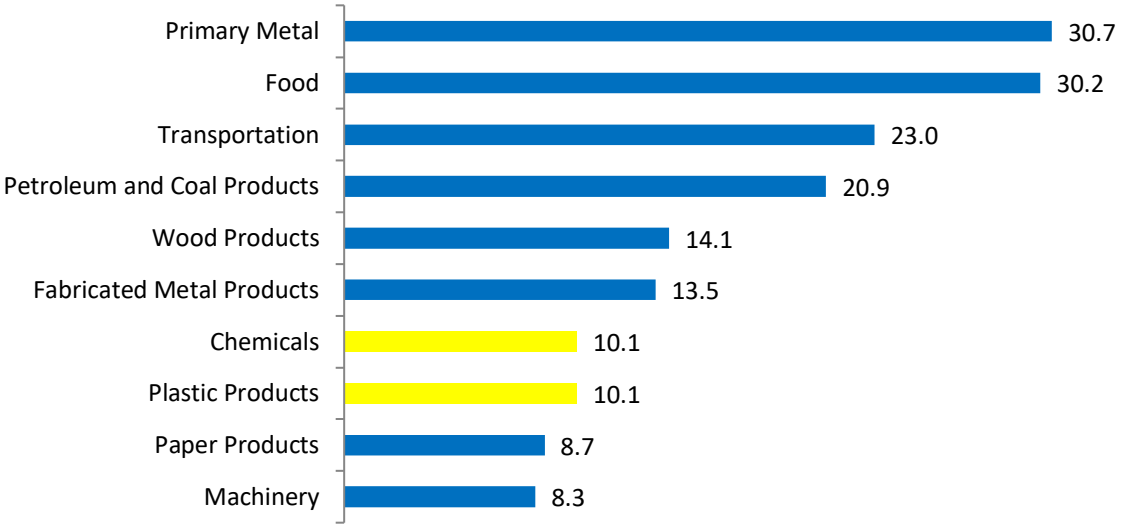
In 2021, shipments of industrial chemicals were $3.96 billion an 18.9 per cent increase from 2020 (Table 19). The industrial chemical industry in Quebec is concentrated in the eastern end of Montreal and along the south shore of the St. Lawrence River.

Table 19: Quebec Chemical Industry Shipments

Shipments, $billion	2020	2021	Change 2020-21
All chemicals	9.2	10.1	9.9%
Industrial chemicals	3.32	3.96	18.9%

Based on shipments Chemicals was the 7th largest manufacturing industry (Figure 29).

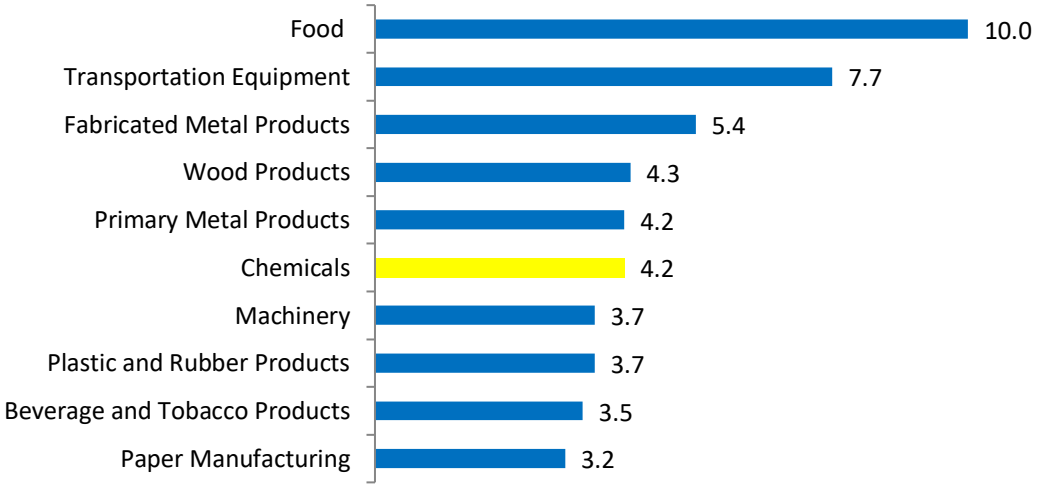
Figure 29: Top 10 Manufacturing Industries in Quebec by Value of Shipments, $ Billion



• Value Added

Based on value added, chemicals ranked 6th among all manufacturing industries in Quebec in 2020 (Figure 30).

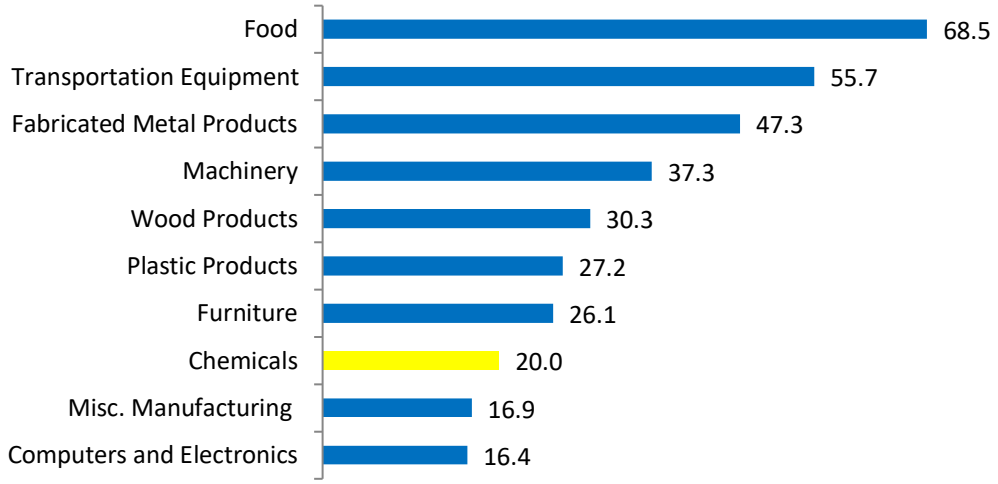
Figure 30: Top 10 Manufacturing Industries by Value Added in Quebec



Employment Ranking

The chemical industry employed 20,002 people in Quebec in 2021. When indirect employment is included, it is estimated that the chemical industry supports 100,000 additional jobs in the province. The industrial chemical industry employs 3,233 and supports an additional 16,160 jobs in the province. When compared to all manufacturing industries in the province, chemicals ranked 8th (Figure 31).

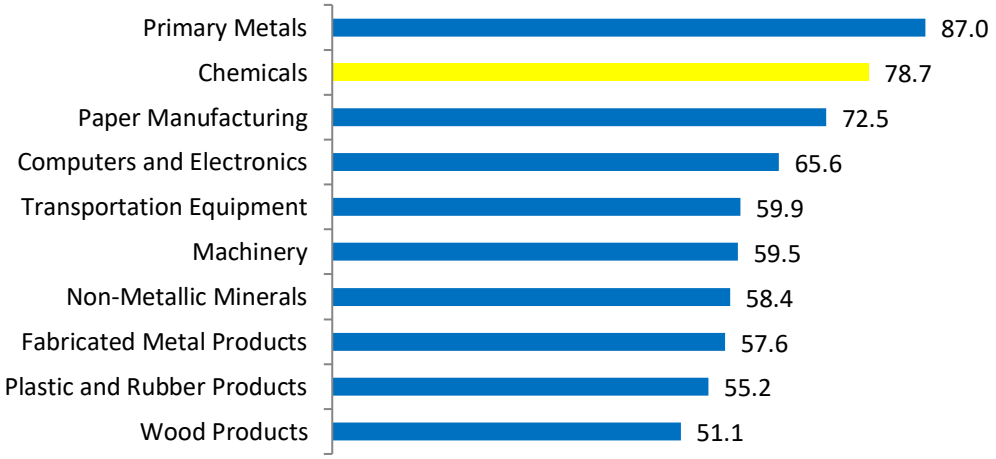
Figure 31: Top 10 Manufacturing Industries by Employment in Quebec



Salaries and Wages

The chemical industry paid a total of $1.57 billion in salaries and wages in the province in 2021, corresponding to an average annual salary of $78,700, which placed the industry 4th in Quebec (Figure 32). **For all manufacturing, the average salary in the province was $56,670**.

Figure 32: Top 10 Industries by Average Salary in Quebec, $ Thousands



Trade

The value of exports by the chemical industry from Quebec in 2021 was $6.8 billion and imports were $9.9 billion (Table 20). The United States was the destination for 87 per cent of exports, followed by Mexico (2.5 per cent) and Belgium (2.3 per cent). Quebec is different from the other provinces in that a much lower proportion of its imports come from the United States (26 per cent), followed by Germany (11 per cent), France (8 per cent) and China (6 per cent).

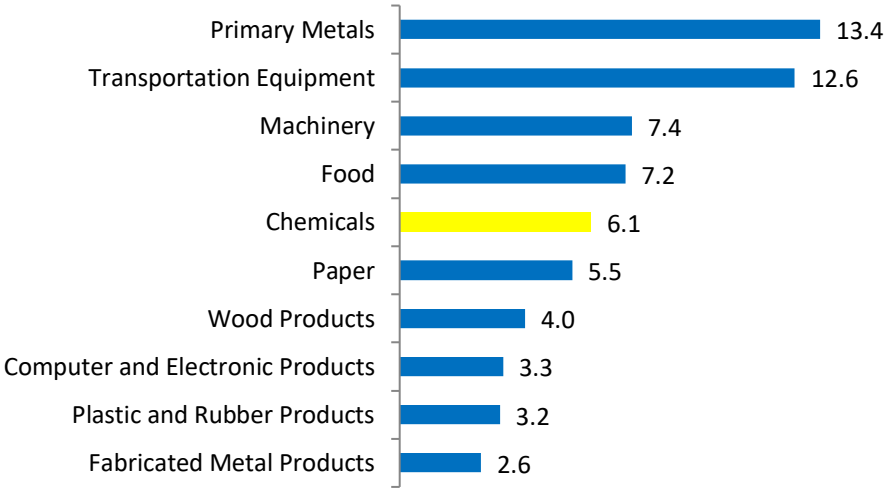
For industrial chemicals, exports from the province in 2021 were $3.2 billion, and imports were $3.2 billion. The United States was the destination for 81 per cent of exports, followed by Mexico (4 per cent) and Spain (2 per cent). The United States was the source of 33 per cent of imports, followed by China (11 per cent), and Germany (7 per cent).

Table 20: Trade by the Chemical Industry in Quebec

Value of trade, $ billion		2020	2021	Change 2020-21
All chemicals	**Imports**	8.4	9.9	17.4%
	Exports	6.1	6.8	11.6%
Industrial chemicals	**Imports**	2.9	3.4	17.1%
	Exports	2.7	3.2	17.8%

Compared to all other manufacturing industries, chemicals were the 5th largest export industry (Figure 33).

Figure 33: Top 10 industries by Value of Exports from Quebec, $ Billion



Industry Profiles

The segments of the chemical industry of primary interest to CIAC members are profiled according to the following categories:

- Petrochemicals and other organic chemicals
- Inorganic chemicals
- Synthetic resins, rubbers and fibres
- Specialty chemicals

a. Petrochemicals and Other Organic Chemicals

Statistics Canada reports data on organic chemicals in two industry groups:

- NAICS 32511 – Petrochemicals
- NAICS 32519 – Other organic chemicals.

The petrochemicals industry only includes hydrocarbons. The main petrochemicals produced by CIAC members in Canada are ethylene, propylene, butylenes, butadiene, higher olefins, alkanes, benzene, toluene, xylenes, and styrene. Ethylene is the largest-volume petrochemical; it is always consumed very close to the point of production so almost none is traded.

Organic chemicals that contain atoms other than hydrogen and carbon are captured in the other organic chemicals industry. CIAC members are producers of all of the largest-volume chemicals in this category in Canada: methanol, isopropyl alcohol, and ethylene glycol.

Table 21: Principal Statistics for Petrochemicals and Other Organic Chemicals

	2017	2018	2019	2020	2021
Establishments					
Petrochemicals	27	16	29	29	27
Other organic chemicals	150	92	145	134	136
Shipments $M					
Petrochemicals	6,747	7,008	5,945	5,138	6,876
Other organic chemicals	4,820	6,181	5,601	4,716	5,635
Employment					
Petrochemicals	2,205	1,963	1,884	1,820	1,933
Other organic chemicals	3,543	3,555	3,137	2,917	2,852
Exports $M					
Petrochemicals	1,880	2,489	2,061	1,617	2,269
Other organic chemicals	4,138	4,240	3,866	4,057	4,396
Imports $M					
Petrochemicals	966	1,067	846	629	1,088
Other organic chemicals	6,292	6,613	6,537	6,497	8,152

Commodity Data

Statistics Canada reports production data for a limited number of organic chemicals (Table 22).

Table 22: Canadian Production of Specific Organic Chemicals, Kilotonnes

	2016	2017	2018	2019	2020
Benzene	597	807	826	727	610
Toluene	128	477	397	395	112
Xylenes	307	646	583	584	X
Butadiene	215	235	235	228	241
Propylene	515	562	535	542	485
Formaldehyde	149	154	151	138	121

More data exists for imports and exports than for domestic production. Table 23 shows the exports for a select range of organic chemicals, in both tonnage and dollar value terms.

Table 23: Canadian Exports of Select Organic Chemicals, Kilotonnes

	Value, $M	Quantity, kt	Top Markets
Benzene	140	113	USA 75% Belgium 25%
Butadiene	94	80	USA 99%
Ethylene glycol	721	1,088	China 64% USA 24% Singapore 2%
Higher olefins	245	160	USA 97% China 1%
Isopropyl alcohol	122	74	USA 99%
Methanol	228	398	USA 99%
Propylene	146	79	USA 99%
Styrene	714	479	USA 100%

Table 24: Canadian Imports of Select Organic Chemicals, Kilotonnes

	Value, $M	Quantity, kt	Top Markets
Benzene	29.7	3	USA 90% China 7% Japan 4%
Butadiene	4.8	3.5	South Korea 54% USA 44%
Ethylene glycol	14	10.9	USA 98%
Higher olefins	4.4	1.8	USA 87% South Africa 10%

			Saudi Arabia 7%
Isopropyl alcohol	29	18	USA 68% China 7%
Methanol	145	607	Trinidad and Tobago 75% USA 15%
Propylene	4.6	0.66	USA 97%
Styrene	2.3	1.2	USA 99%

- **CIAC Members Producing Petrochemicals and Organic Chemicals in Canada**

  - ARLANXEO Canada Inc.
  - BASF Canada
  - Canada-Kuwait Petrochemical Corporation[5]
  - Dow Chemical Canada ULC
  - Evonik Oil Additives Canada Inc.
  - H.L. Blachford Ltd.
  - Imperial Oil
  - INEOS Canada Partnership
  - Inter-Pipeline Ltd.[6]
  - Lanxess Canada Co./Cie
  - Jungbunzlauer Canada Inc.
  - MEGlobal Canada ULC
  - Methanex Corporation
  - Nouryon
  - NOVA Chemicals Corporation
  - SEQENS
  - Shell Chemicals Canada Ltd.
  - Stepan Canada Inc.
  - W.R. Grace Canada Corp

b. Industrial Gases

Statistics Canada reports data on Industrial gases as part of basic chemicals within NAICS 32512. Under this category there is a single sub-category – Industrial Gas Manufacturing

Industrial Gas manufacturers produce organic and inorganic gases in compressed - liquid and solid forms. Some of the most used industrial gases include: acetylene, carbon dioxide, helium, hydrogen, nitrogen, dry ice and oxygen. Manufacturing processes also include industrial gas separation and air separation configurations.

Often Industrial Gas manufacturers will co-locate on larger manufacturing sites utilize feedstock streams produced as co-products from the larger facility. However, this is not a hard rule, with diverse customer markets and a relatively small physical footprint industrial gas manufacturers can also locate closer to demand in light industrial areas.

[5] Currently pre-production facility is under construction
[6] Currently pre-production facility is under construction

Table 25: Principal Statistics for Industrial Gases

	2017	2018	2019	2020	2021
Establishments	*	145	145	101	115
Shipments $M	1,053	1,196	1,311	1,180	1,525
Employment	1,059	1,173	1,049	1,074	1,146
Exports $M[7]	147	138	120	125	138
Imports $M	192	217	186	176	180

• CIAC Members Producing Industrial Gases

- Praxair Canada Inc.

c. Inorganic Chemicals

Statistics Canada reports data on inorganic chemicals as part of basic chemicals within NAICS 32518. Under this category there are two sub-industry classifications:

- NAICS 325811 – Alkali and chlorine
- NAICS 325819 – Other inorganic chemicals.

Since 2010, shipment and employment data have been suppressed at the 6-digit NAICS level and only reported at the 5-digit level.

The main inorganic chemicals produced by CIAC members in Canada are: chlorine, sodium hydroxide, hydrochloric acid, hydrogen peroxide, sodium chlorate, sodium silicates, sulphuric acid, and titanium dioxide.

Table 26: Principal Statistics for Inorganic Chemicals

	2017	2018	2019	2020	2021
Establishments					
Chlor-alkali	7	5	5	5	5
Other inorganic chemicals	128	104	104	104	104
Shipments $M	4,585	4,581	4,310	3,484	3,568
Employment	4,588	3,693	3,420	3,340	3,569
Exports $M[8]					
Chlor-alkali	64	69	77	78	119
Other inorganic chemicals	3,512	3,724	3,703	2,730	3,534
Imports $M					
Chlor-alkali	435	522	456	458	411
Other inorganic chemicals	1,846	2,186	2,847	3,333	3,285

[7] Exports and Imports sometimes exceed shipments due to different databases used to collect the two sets of data.

[8] Exports and Imports sometimes exceed shipments due to different databases used to collect the two sets of data.

Commodity Data

Statistics Canada reports production data for a limited number of inorganic chemicals (Table 25).

Table 27: Canadian Production of Specific Inorganic Chemicals, Kilotonnes

	2016	2017	2018	2019	2020
Carbon black	215	241	243	237	188
Chlorine	411	894	269	x	367
Hydrogen peroxide	221	239	243	237	234
Sodium hydroxide*	453	453	445	450	445

*estimated

More data exists for imports and exports than for domestic production.

Table 28: Canadian Exports of Select Inorganic Chemicals, Kilotonnes

	Value, $M	Quantity, kt	Top markets
Carbon black	294	201	USA 79% China 3% Belgium 3%
Chlorine	77	275	USA 100%
Hydrochloric Acid	38	317	USA 99%
Hydrogen Peroxide	38	85	USA 99%
Sodium Chlorate	294	454	USA 84% Japan 9%
Sodium Hydroxide	78	53	USA 99%
Sodium Silicate	19	35	USA 99%
Sulphuric Acid	168	1,904	USA 99%
Titanium Dioxide	38	11	Germany 67% India 10% Brazil 8% USA 6%

Table 29: Canadian Imports of Select Inorganic Chemicals

	Value, $M	Quantity, kt	Top Markets
Carbon black	97	60	USA 83% Russia 12%
Chlorine	7.4	13	USA 98%
Hydrochloric Acid	6.2	41	USA 99%
Hydrogen Peroxide	13	5	USA 92% Switzerland 5%

Sodium Chlorate	1.8	0.91	USA 61% U.K. 32%
Sodium Hydroxide	12.5	18	USA 75% Taiwan 12% China 11%
Sodium Silicates	13	24	USA 89% Netherlands 4% China 4%
Sulphuric Acid	20	123	USA 99%
Titanium Dioxide	50	12	China 67% France 15% USA 7% Germany 3%

• CIAC Members Producing Inorganic Chemicals in Canada

- Arkema Canada Inc.
- CCC Sulphur Products
- Chemtrade
- ERCO Worldwide
- Evonik Canada Inc.
- KRONOS Canada Inc.
- National Silicates Limited
- Cabot Canada Ltd.
- NorFalco Sales Inc., GLENCORE Canada Corporation
- Nouryon
- Olin Canada ULC
- Praxair Canada Inc.
- Solvay Canada Inc.
- W.R. Grace Canada Corp
- United Initiators Canada Ltd

c. Synthetic Resins, Rubbers and Fibres

There are two industry sub-groups within this classification:

- NAICS 32521 – Synthetic resins and rubbers
- NAICS 32522 – Synthetic fibres.

Since 2013, shipment and employment data have been suppressed at the 5-digit NAICS level and only reported at the 4-digit level.

The main synthetic resins and rubbers produced in Canada are polyethylene, ethylene vinyl acetate, polystyrene, PVC, polyacrylamides, PET, nylons, urea and phenol formaldehydes, latex emulsions, unsaturated polyesters, silicones, and butyl and halobutyl rubbers. Synthetic fibres are produced in Canada using a variety of domestically-produced and imported resins.

Table 30: Principal Statistics for Synthetic Resins Rubbers and Fibres

	2017	2018	2019	2020	2021
Establishments					
Synthetic resins and rubbers	119	91	112	108	110
Synthetic fibres	28	17	32	30	30
Shipments $M	9,161	10,571	9,597	8,333	11,268
Employment, 000	4,484	5,215	5,009	4,542	4,837
Exports $M					
Synthetic resins and rubbers	7,626	8,514	7,712	7,028	10,064
Synthetic fibres	291	273	283	232	266
Imports $M					
Synthetic resins and rubbers	8,734	9,249	8,620	7,735	10,941
Synthetic fibres	601	597	528	430	485

Commodity Data

Within these industries, Statistics Canada reports production data only for polyethylene (Table 28).

Table 31: Canadian Production of Synthetic Resins, Kilotonnes

	2016	2017	2018	2019	2020
Polyethylene	3,854	3,854	3,599	3,871	4,052

Table 32: Canadian Exports of Select Synthetic Resins and Rubbers

	Value, $M	Quantity, kt	Top Markets
Butyl and halobutyl rubbers	199.6	52	China 39% USA 37% Mexico 7% South Korea 2%
Polyethylene	7,138	3,358	USA 86% Mexico 4%

Table 33: Canadian Imports of Select Synthetic Resins and Rubbers

	Value, $M	Quantity, kt	Top Markets
Butyl and Halobutyl Rubbers	19.3	6.4	Belgium 48% USA 21% China 10%
Polyethylene	1,273	900	USA 96%

CIAC Members Producing Synthetic Resins, Rubbers and Fibres in Canada

- ARLANXEO Canada Inc.
- BASF Canada
- Dow Chemical Canada ULC
- DuPont Canada Company
- Imperial Oil
- NOVA Chemicals Corporation

d. Specialty Chemicals

This profile is different from the others in the series. There is no Statistics Canada aggregation that provides data for an industry called specialty chemicals. Therefore, a number of assumptions have been made to derive an approximation for the size of this industry grouping.

Examples of the types of specialty chemicals produced by CIAC members include: fatty acids, maleic anhydride, plasticizers, citric acid, photochemicals, and additives for lubricants, plastics and rubber.

- Assumption #1: Specialty chemicals are a subset of NAICS 32519 – Other organic chemicals. Very little, if any, specialty chemicals fall within the petrochemical industry as it is comprised primarily of commodity products. For this analysis it is assumed that inorganic chemicals and synthetic resins and rubbers can also be excluded.

- Assumption #2: The ratio of specialty chemical to commodity chemical exports can be used to estimate the value of shipments and employment attributable to specialty chemicals. This assumption allows the use of relatively-detailed trade data to gain a measure of the level of specialty chemical production in Canada. However, deciding which products are commodity versus which are specialty remains subjective.

There are about 15 facilities in Canada producing ethanol that are captured within the other organic chemical industry. Since ethanol is primarily used for fuel, these facilities are not considered part of specialty chemicals.

Estimated statistics for the total other organic chemicals industry and the specialty component are shown in Table 30. The data for the other organic chemicals industry includes both commodity and specialty chemicals, and is repeated from the Petrochemicals profile. It is presented again to provide an indication of the relative size of the commodity versus specialty element of the industry.

Table 34: Estimated Principal Statistics for Specialty Chemicals

	2017	2018	2019	2020	2021
Establishments					
Other organic chemicals	150	92	145	145	145
Specialty chemicals	130	72	113	113	113
Shipments $M					
Other organic chemicals	4,820	6,181	5,601	4,716	5,635
Specialty chemicals	1,620	2,660	2,660	2,660	2,660
Employment, 000					
Other organic chemicals	3,543	3,537	3,137	2,917	2,852
Specialty chemicals	1,760	1,880	1,880	1,880	1,880
Exports $M					
Other organic chemicals	4,138	4,240	3,866	4,057	4,396
Specialty chemicals	1,740	1,850	1,620	1,620	1,620
Imports $M					
Other organic chemicals	6,292	6,613	6,534	6,497	8,152
Specialty chemicals	2,640	2,770	2,720	2,720	2,720

Commodity Data

Table 34 shows the exports for a select range of specialty chemicals, in both tonnage and dollar value terms in 2014.

Table 35: Canadian Exports of Select Specialty Chemicals, Tonnes

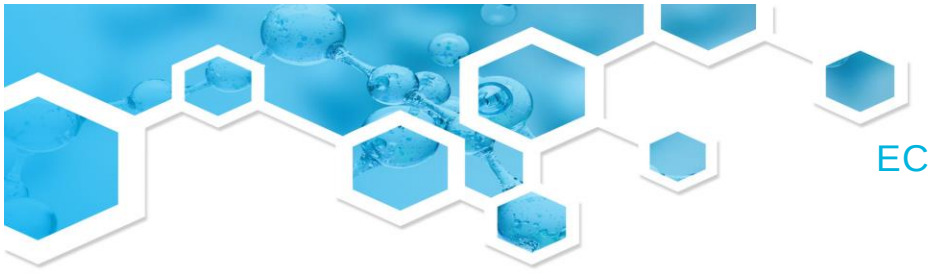
	Value, $M	Quantity, kt	Top Markets
Palmitates and stearates	10.7	4.2	USA 83% Hong Kong 4% China 3%
Dinonyl or didecyl orthophthalates	5.2	1.65	USA 99%
Azo compounds	2.1	0.03	USA 83% Japan 10%
Cyanine dyes	41.9	1.09	USA 100%
Azo dyes	3.8	0.62	USA 92% Spain 2% China 2%
Other fatty acids	4.7	8.93	USA 61% China 22% Germany 13%

Table 36: Canadian Imports of Select Specialty Chemicals. Kilotonnes

	Value, $M	Quantity, kt	Top Markets
Palmitates and stearates	49	18	USA 42% Malaysia 42% India 4% Indonesia 2%
Dinonyl or didecyl orthophthalates	5.1	3.47	Germany 37% Sweden 32% USA 25%
Azo compounds	11.3	0.85	Mexico 89% USA 4% Japan 3%
Cyanine dyes	106.2	7.81	USA 50% China 19% Germany 12% India 9%
Azo dyes	41	2.62	USA 39% India 29% France 14%
Other fatty acids	38	33.9	Malaysia 66% USA 21% India 9%

CIAC Members Producing Specialty Chemicals in Canada

- BASF Canada
- Evonik Oil Additives Canada Inc.
- H.L. Blachford Ltd.
- Imperial Oil
- Jungbunzlauer Canada Inc.
- Lanxess Canada Co./Cie
- Nouryon
- Procter and Gamble, Inc.
- SEQENS
- Stepan Canada Inc.
- W.R. Grace Canada Corp



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1240 - 45 O'Connor Street, Ottawa, ON K1P 1A4 | 613-237-6215

canadianchemistry.ca | @ChemistryCanada

info@canadianchemistry.ca

CHEMISTRY INDUSTRY ASSOCIATION OF CANADA