

# Exploring for talc in Quebec

## SUMMARY

In light of the growing talc trade between Canada and the United States, a business opportunity currently exists for the discovery and development of a high grade talc deposit in Quebec.

The sectors that offer the greatest potential are those underlain by dolomitic marbles of the Grenville and by ophiolites of the Appalachian belt. Given the present-day context with respect to asbestos minerals, any new talc deposit should be as free as possible of the minerals chrysotile and tremolite.

## 1-ECONOMICS

### Uses of Talc

Talc is a soft hydrated magnesium silicate that occurs as fine platelets. Other than its use in the production of ceramics and refractories, almost 60 % of North American high quality talc is consumed by the paint, paper and plastics industries.

### General specifications of industrial talc

The specifications for high quality talc include purity, whiteness and particle size. A 95 % pure product can be obtained by removing gangue minerals, and whiteness is improved by crushing or micronization.

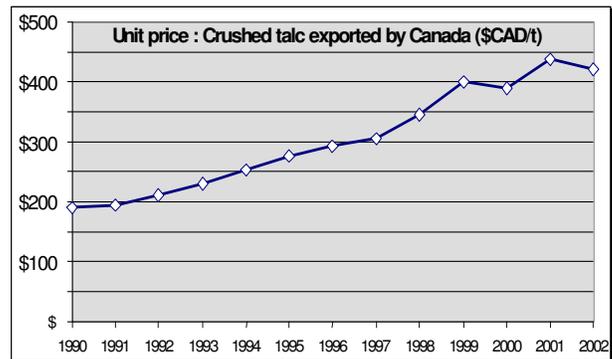
### Prices

Talc prices are highly variable, ranging from \$100 to more than \$1,000 per metric ton according to its purity and fineness. Raw or crushed ore is worth few tens of dollars per metric ton.

### Canada-United States Trade

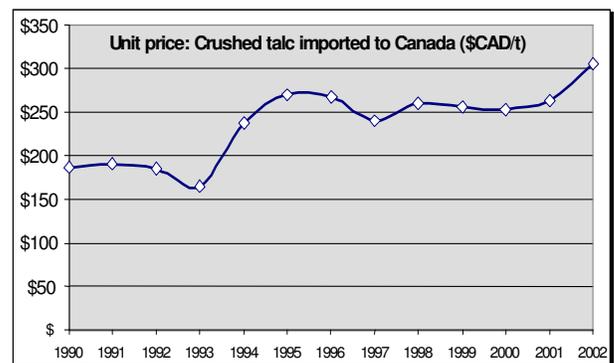
Analysis of Canadian and American statistics reveals the size and evolutionary trends of the talc trade between the two countries. The data demonstrates that:

- High grade talc (**crushed or powdered**) is at the heart of **increasing trade**. American imports of crushed talc in particular have more than doubled since 1990 (127,000 t in 2002). During that same period, the unit value of Canadian exports increased at an average annual rate of **6.8 %**, to reach **\$420/metric ton** in 2002. Canada supplies more than half of the talc imported to the United States.
- The average **unit price** for crushed talc,



exported or imported, increases by **4 to 5 % by year**. The unit value of crushed talc imported to Canada (83,000 t in 2002) surpassed **\$300/t** in 2002;

- The **trade value** increases at a rate of **10 to 12 % per year**.



These statistics signal the development of markets for crushed talc in Canada, including Quebec.

## 2. GEOLOGY & DEPOSIT TYPES

**Talc deposits are of hydrothermal origin. Tectonic activity plays a major role in the formation of talc deposits by allowing fluids to penetrate rocks, creating a micro-permeability that facilitates reactions with the host rock. Deposits can be divided into four types:**

### **Talc deposits associated with metamorphic rocks**

**Regional or contact metamorphism** of siliceous or sandy dolomites and talc-carbonate-bearing siliceous rocks produces dolomitic marbles containing tremolite, actinolite or diopside. These rocks can be transformed into steatite through interactions with silica-rich fluids. Contact metamorphism of dolomites and dolomitic limestone by intrusions may produce large bodies of **high grade talc**. The most favorable sites for talc formation are the contact zones with igneous and sedimentary rocks, as well as fault and shear zones.

### **Talc deposits associated with magnesian carbonate rocks**

Metasomatism or hydrothermal alteration of dolomitic rocks produces talc through interaction with silica- and magnesium-bearing fluids. The silica source may be sediments or hydrothermal solutions derived from various aluminous silicate rocks along strongly tectonized zones. This process creates **high quality talc** that is mainly found in veins that crosscut the dolomitic rocks. These lenticular talc veins may reach several hundred metres in length by several dozen metres in width.

### **Talc deposits associated with ultramafic rocks**

Talc can be formed during serpentinization from **ultramafic rocks** like peridotite. The process is followed by carbonatization during which fluids containing more than 5 % CO<sub>2</sub> are introduced and a talc-carbonate rock is formed. This rock may be further transformed into steatite through the interaction with silica-bearing solutions. The talc rock may replace lenses or large masses of serpentinite. The talc lenses may measure

several hundred metres long by several hundred metres wide. These occurrences constitute the **largest talc deposits** but can contain more impurities, most notably asbestos minerals.

### **Talc deposits associated with mafic rocks**

Talc deposits associated with **mafic rocks** form in the same way as those associated with ultramafic rocks. Talc can develop by serpentinization of mafic rocks like gabbro. These deposits generally produce low quality **soapstone** and are rarely economical to exploit.

## 3. EXPLORATION

**In zones with high potential, large-scale linear structures that served as fluid conduits should constitute priority targets for all types of talc deposits.**

Remote sensing offers excellent possibilities for identifying regional scale structures.

Within orogenic belts, regions underlain by magnesian marble associated with quartzite and intruded by granitoid bodies make excellent targets, especially when coupled with linear structures.

With respect to ultramafic rocks, geochemistry and airborne geophysical surveys can be useful at the regional scale. Areas underlain by ultramafic rocks are characterized by Mg, Fe, Cr, Ni and Co anomalies in soils or stream and lake sediments. Unaltered ultramafic rocks generally correspond to strong magnetic and gravimetric anomalies, whereas altered zones with the potential for local talc concentrations generally display magnetic and gravimetric lows.

At the local scale, detailed mapping and sampling are indispensable. The talc-rich rocks in glaciated regions generally coincide with topographic lows covered by overburden or water. In these cases, ground-based geophysical surveys may be helpful.

More sophisticated methods based on the spectral signature of talc, such as the AVIRIS system of NASA, have been used in Montana to map talc concentrations in outcrops.

## **Business opportunity in Quebec**

Both the volume and value of the talc trade between Canada and the United States have shown strong growth since 1990. This is the case for Quebec, where crushed talc imports were almost \$9 M in 2002 (30,000 metric tons).

It was within this economic context in 1997 that a Quebec producer, Luzenac Inc., launched a plan to produce high quality talc for the paper industry in Saint-Pierre-de-Broughton. The project was evaluated at \$35 M, and it is estimated that planned production for talc concentrate was to total 70,000 to 80,000 metric tons per year. The high quality talc markets that were targeted in the paper industry were no doubt for filler and, probably with equal importance, for coating. The Saint-Pierre-de-Broughton mine was nonetheless closed in spring of 2001 and the factory and flotation installations abandoned due to the discovery of traces of asbestos in the deposit.

Other than the paper markets, there exists a significant demand for purified and micronized talc in sectors such as the paints and plastics industries. For this reason, promising opportunities still exist that warrant the exploration for talc deposits in Quebec.

## **Deposit locations**

In Quebec, the main talc and steatite deposits are located in ultramafic rocks along the ophiolite zone of the **Appalachians** in southwestern Quebec, and the Mont-Albert

sector in the Gaspé region. Slices of serpentized peridotite were incorporated into quartzitic sedimentary rocks and were partially or totally transformed into steatite or into talc-carbonate schists by metasomatism.

Several soapstone showings can be found in the **Abitibi** region of the Superior Province. These showings are locally associated with the ultramafic flows of the **Malartic Group**. They consist mainly of serpentine containing less than 30 % talc.

There has yet to be any documented talc deposits associated with dolomitic rocks in Quebec. In comparison, the Henderson mine, exploited by Cantalc (formerly Canada Talc Ltd) 200 km east of Toronto, has been producing high grade talc for more than 100 years. This mine is located within **dolomitic marbles of the Grenville Supergroup**, a geological environment that covers a large region of Quebec. The Quebec segment of the Grenville thus includes many zones of dolomitic marbles and magnesian calc-silicate rocks that have the potential to contain high purity talc deposits. **This environment constitutes a high priority zone that has been under explored.**

Given the present-day context with respect to asbestos minerals, any new talc deposit should be as free as possible of the minerals chrysotile and tremolite. Zones containing very little of these minerals can be found in any talc deposit type.

# Map displaying favorable lithologies for talc exploration in Quebec and the location of deposits and showings

Deposits	
5	GILMONT
20	CAREY CANADIAN (ZONE D)
6	WOLFESTOWN-IRLANDE
10	PETIT MONT HAM
13	VILLAGE-DES-CHUTES
14	STE-CORINNE NO
22	LAC NICK
25	ETANG SALLYS
29	UMEX-1
31	MONTAGNE DU NEUF-SE
33	RIV. PALMER-EST NO 3
34	RIV. PALMER-EST NO 2
42	MEGANTIC TALC
49	BRIGGS
66	FOY
67	NUTBROWN
68	LAC BROMPTON-NORD
71	KATEVILLE
72	EASTMAN-SSO
78	BANFIELD
79	CHARTROT
89	BRAS AU SAUMON
90	TROU 18-17-66
15	MONT SUTTON
16	ROUNDTOP
17	EAKINS
18	KNOWLTON-SSO
19	SUTTON JUNCTION-NORD
21	RIV. DU CINQ
23	ETANG CHALMERS
24	BOLTON GLEN-SO
26	THOMPSON HARBOUR
30	BAIE INDIENNE
36	JUTRAS
38	LABONTE-TOUSSAINT
43	LABBE ASBESTOS
44	COLLINES CLAPHAM
45	LAC DU HUIT
46	PROSPECT NICOLET
56	SAINT-PIERRE-DE-BROUGHTON-SE
57	MORIN NO 1
60	LAC BONNE-ALLEE
62	BRILL-NORD
63	ST-ETIENNE-DE-BOLTON
64	LAC STUKELY-OUEST
73	ST-DENIS-DE-BROMPTON-NO
76	SOUTH BOLTON
80	MANSONVILLE-NNO
81	MANSONVILLE-NORD-TALC
82	RED HILLS
65	MINE BROUGHTON
74	MINE VAN REET (BAKER TALC)
77	MINE MARCOUX
2	MINE CARTER
9	MINE CLARK (TALC)
12	MINE DU MONT ST-ADRIEN
27	MINE ASBESTOS HILL
28	MINE HARVEY HILL
35	MINE GUILLEMETTE-PERRON
37	MINE TOUSSAINT
39	MINE HOULE
40	MINE ROBERTSONVILLE SOAPSTONE
41	MINE CYR (TALC)
48	MINE KITCHENER
50	MINE FRONTENAC
51	MINE FRASER
52	MINE MONTREAL (TALC)
53	MINE RIV. NADEAU
54	MINE RIV. PALMER
55	MINE CYR (STEATITE)
58	MINE PHARO
59	MINE IVES
61	MINE DE STEATITE D'EASTRAY
69	MINE BAKER
70	MINE TOMIFOBIA NO 1
75	MINE BOLTON-SUD
83	MINE PONTBRIAND (NATIONAL ASBESTOS)
84	MINE PONTBRIAND-SUD
85	MINE FEDERAL
86	MINE CYR
88	MINE DU RANG II, LOTS 26-27

Showings	
1	LAC SUNDAY-SE
3	LAC BREECHES-EST
4	COLLINES BISBY
7	REED
8	LAC SUNDAY-SO
11	RIV. PALMER-EST No 1

Closed mines	
87	RUMPELVILLE
32	MINE RUMPELVILLE
47	MINE BLACK LAKE (LAC D'AMIANTE)

Map of southern Quebec (modified from report DV 2003-04) showing the location of documented talc deposits and showings, as well as the distribution of the most favorable lithologies for talc deposits. The numbers correspond to the list above.

