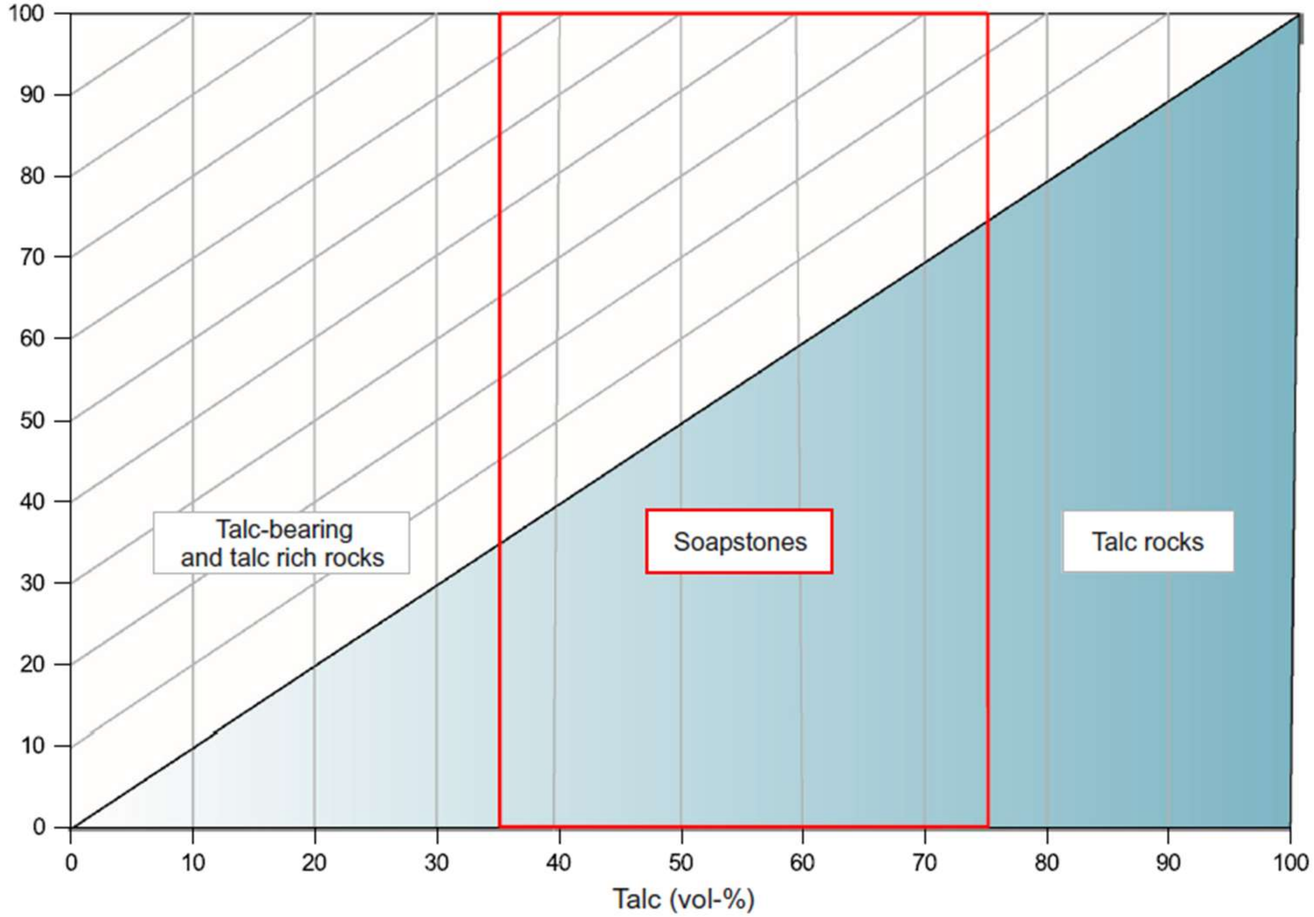
The Mammutti soapstone

What is soapstone?

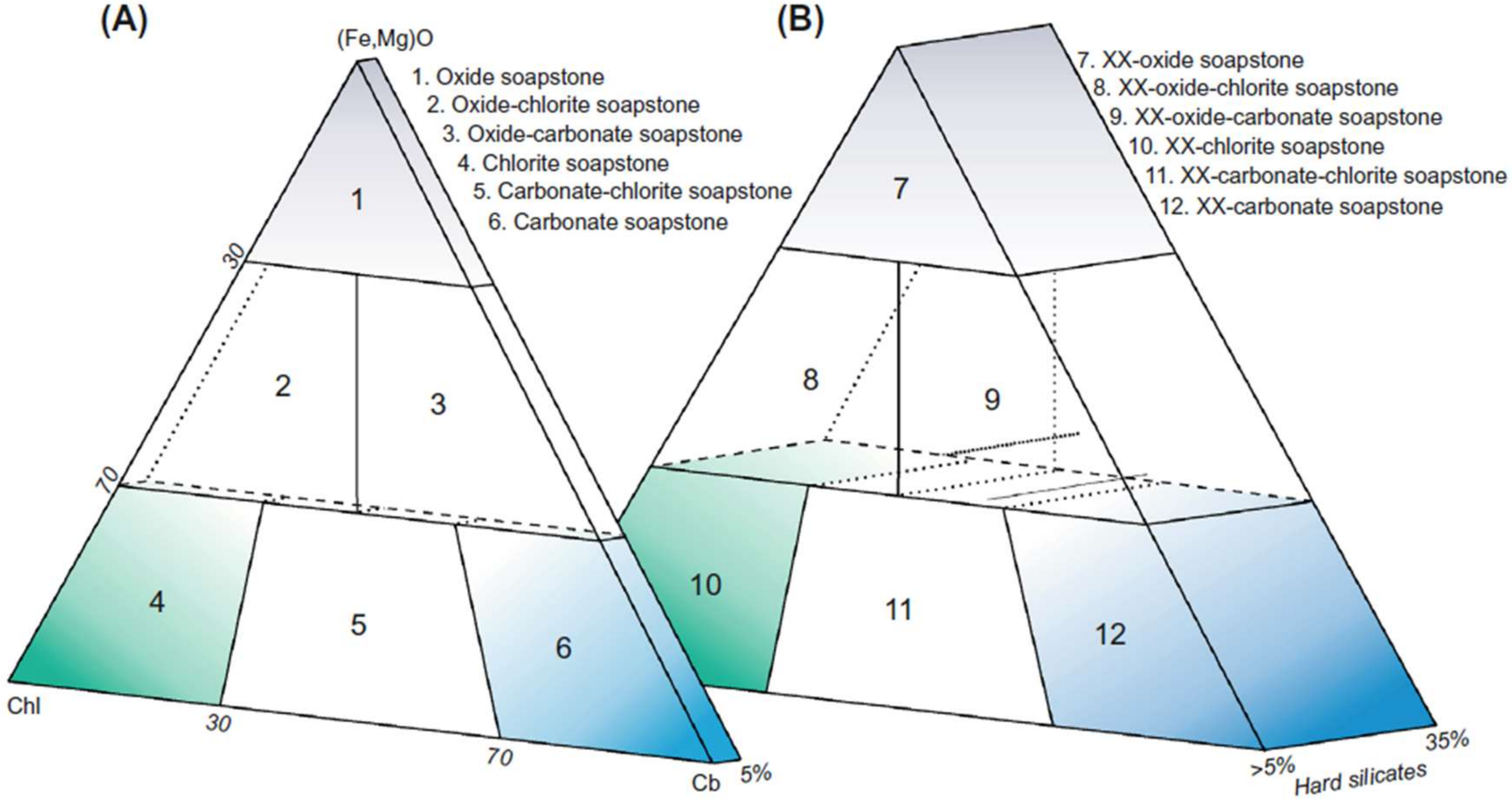
- In many languages the name soapstone refers to the soft and workable nature of the stone. Carving possibility is anyhow wide expression and it doesn't take account of which minerals the stone consists of. The softness of soapstone is based on the high content of talcum.
- In this soapstone classification proposal, the principles of the IUGS have been strictly followed. The proposed scheme does not consider the environment in which the rock occurs or was formed.

  - *The first principle is that the term "soapstone" should be retained for those rocks in which the modal content of talc is between 35 and 75%.*
  - *The second principle is that soapstone cannot contain more than 35% hard silicate minerals (like olivine, pyroxene, serpentine, amphiboles).*

Talc content in soapstones



The soapstone classification diagram



In this classification 30% and 70% boundaries in used in Chlorite / Carbonate / Oxide -ratios.

Sample of classification

Mineraali	%
~~Talkki~~	~~53.8~~
Karbonaatti	37.4
Kloriitti	5
Oksidi	3.8

Now the talcum can be forgotten. Amount of it states the sample is a soapstone. Now its to count together the amounts of carbonates, chlorites and oxides. So:

$$37.4\ \% + 5\ \% + 3.8\ \% = 46.2\ \%$$

Next the amount of each mineral will be divided by the sum of them all:

$$\frac{37.4\ \%}{46.2\ \%} = 0.809524 \qquad \frac{5\ \%}{46.2\ \%} = 0.108225$$

$$\frac{3.8\ \%}{46.2\ \%} = 0.082251$$

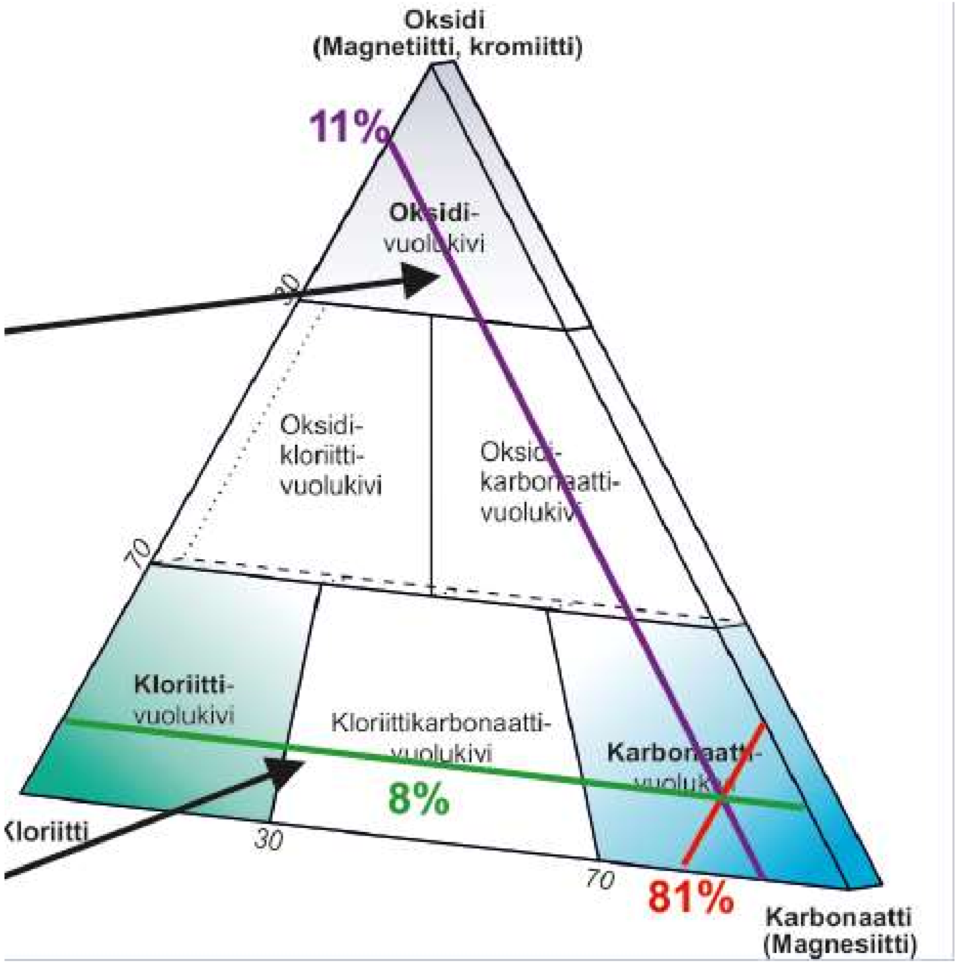
Then each quota share will be multiplied by 100 so we get the relative amount of each mineral:

$$0.809524 \times 100 = 80.95... \approx 81\ \%$$ **Carbonates**

$$0.108225 \times 100 = 10.82... \approx 11\ \%$$ **Chlorites**

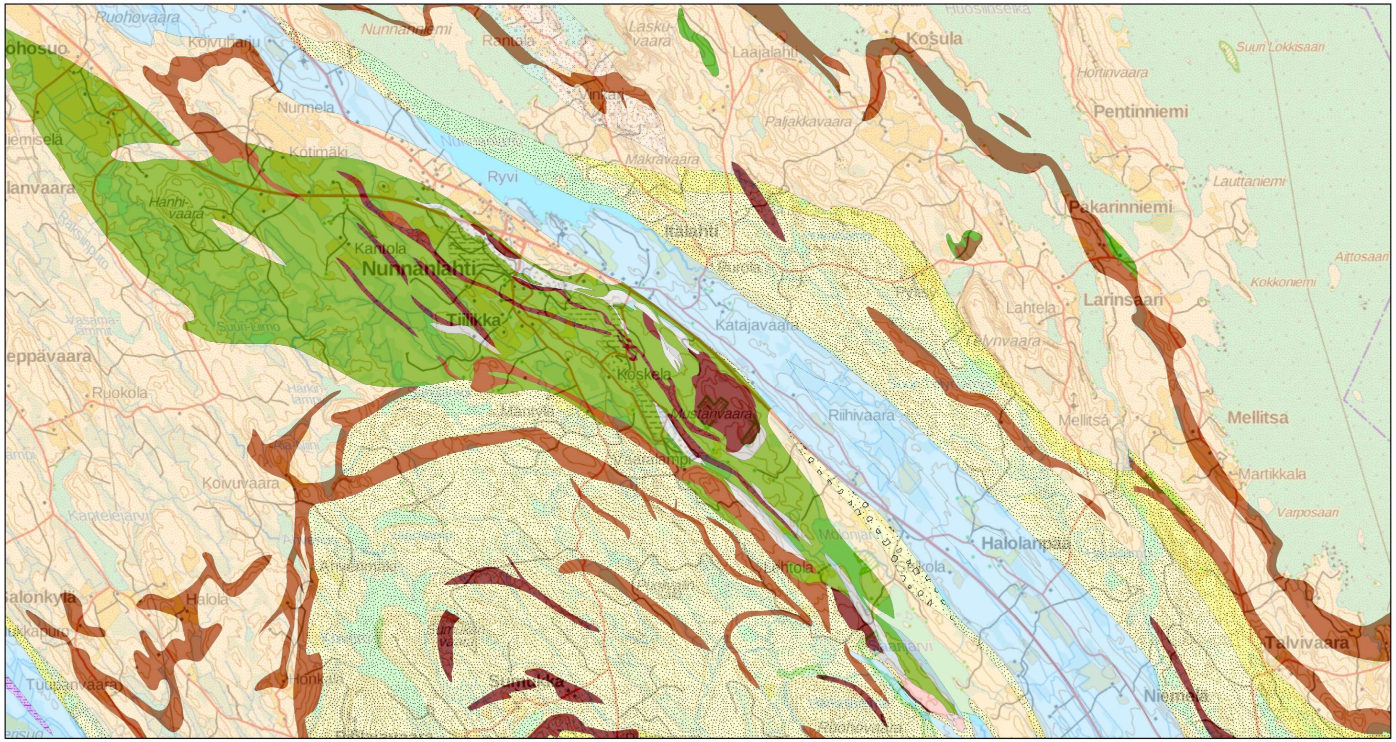
$$0.082251 \times 100 = 8.22... \approx 8\ \%$$ **Oxides**

The sum of quota shares must always be 100!



The soapstone of Nunnanlahti

Bedrock of Finland



tammikuu 4, 2019

1:43 347

0 0,5 1 2 mi

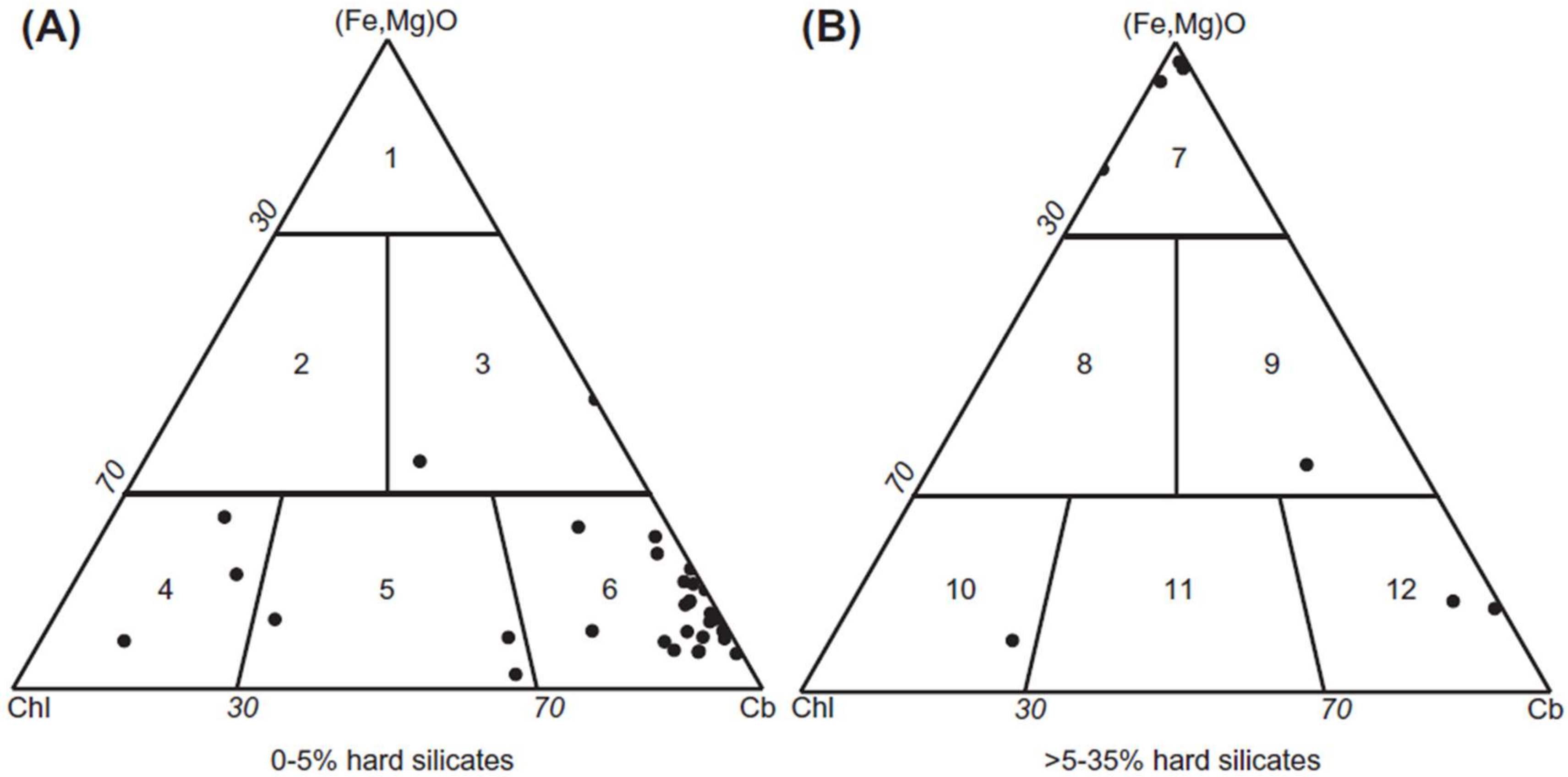
0 0,75 1,5 3 km

Maanmittauslaitos, Esri Finland

Source: http://gtkdata.gtk.fi/Kalliopera/index.html

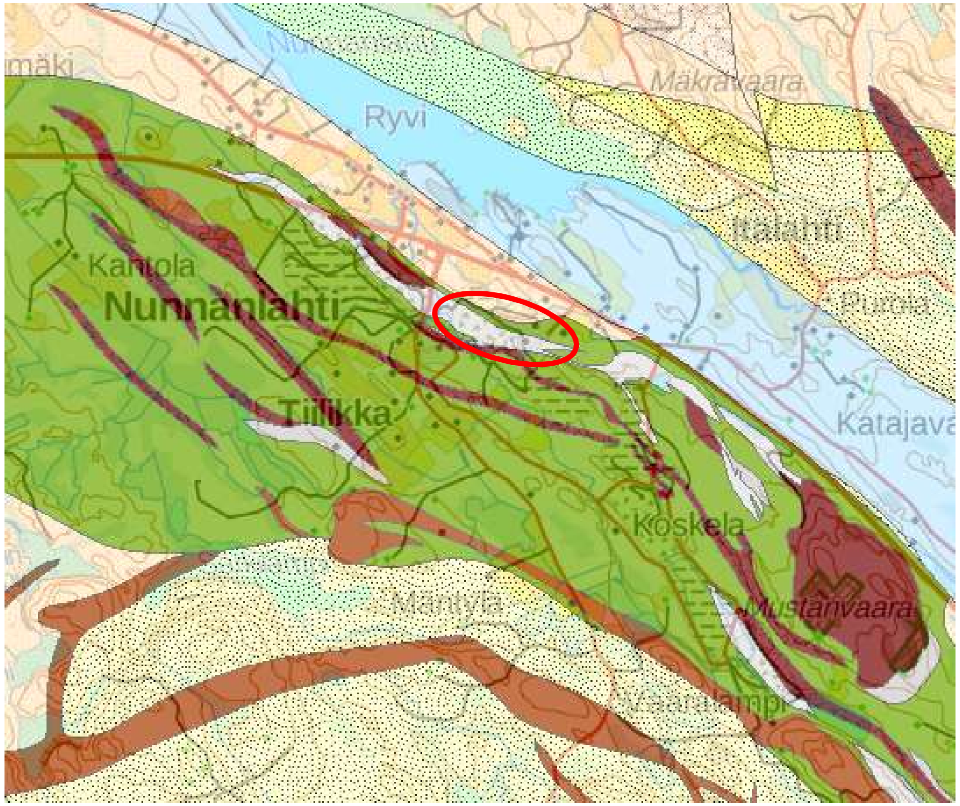
In the greenstone belt of Nunnanlahti there are several soapstone massifs.
They are visible as light areas in the chart of GTK Finland.

Classifying Nunnanlahti soapstones

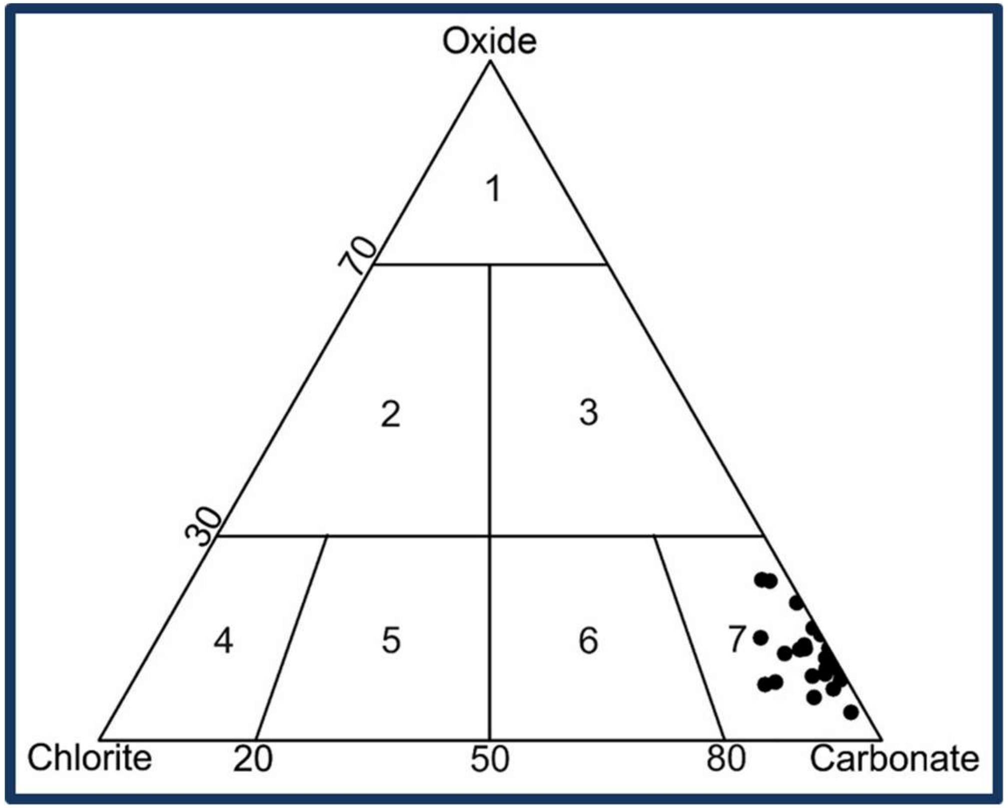


Pictures A and B presenting some soapstone compositions from Nunnanlahti greenstone belt.

The soapstone type of Nunnanlahden Uuni Oy

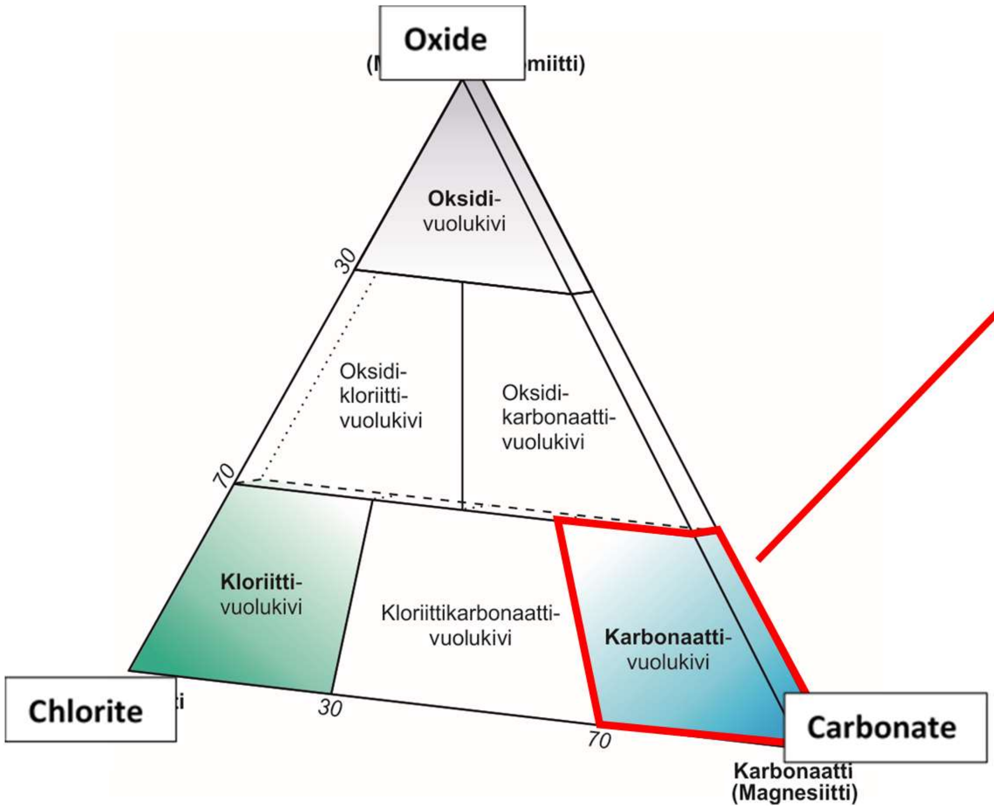


Soapstone massif on greenstone belt. On the massif located the quarry of Nunnanlahden Uuni Oy



The soapstone type of Nunnanlahden Uuni Oy classifies to be carbonate soapstone.

The carbonate of Nunnanlahden Uuni Oy soapstone type

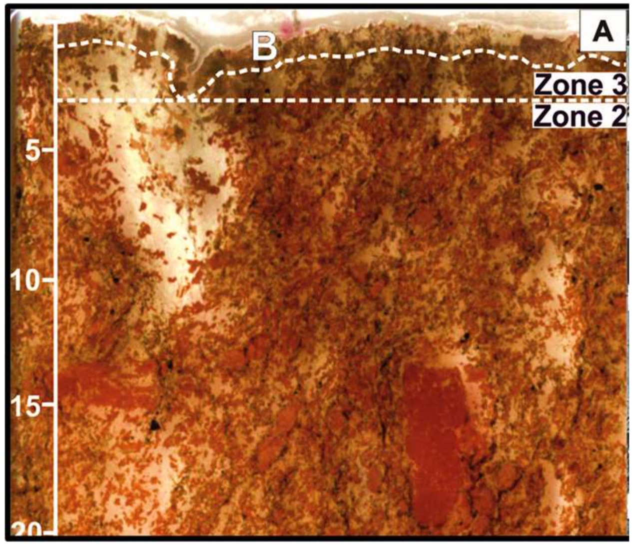


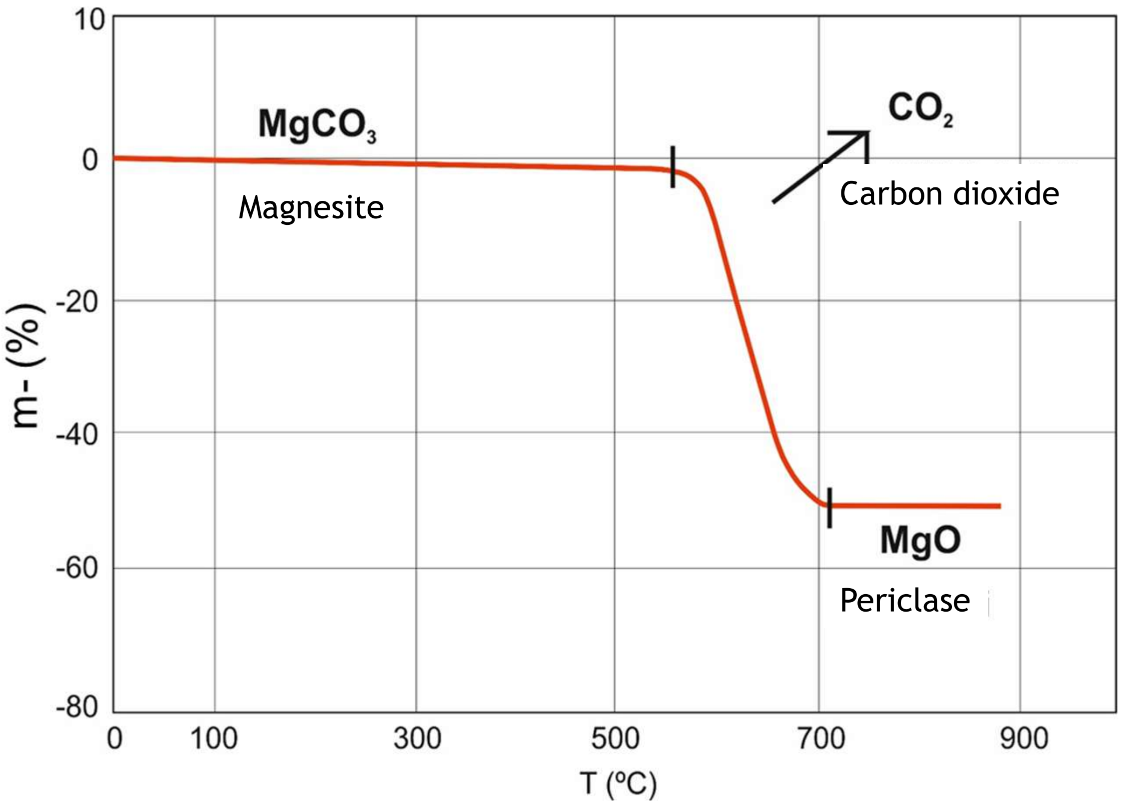
Carbonates

- Calcite
- Gaspeite
- Magnesite — Magnesium and a little iron
- Otavite
- Rhodochrosite
- Siderite
- Smithsonite
- Sferokobaltite
- Aragonite
- Cerussite
- Strontian
- Witherite
- Rutherfordine

How Magnesite soapstone minerology adapts to the conditions of burning chambers.

When the surface of the burning chamber gets higher than 520 ºC magnesite transfers to periclase.



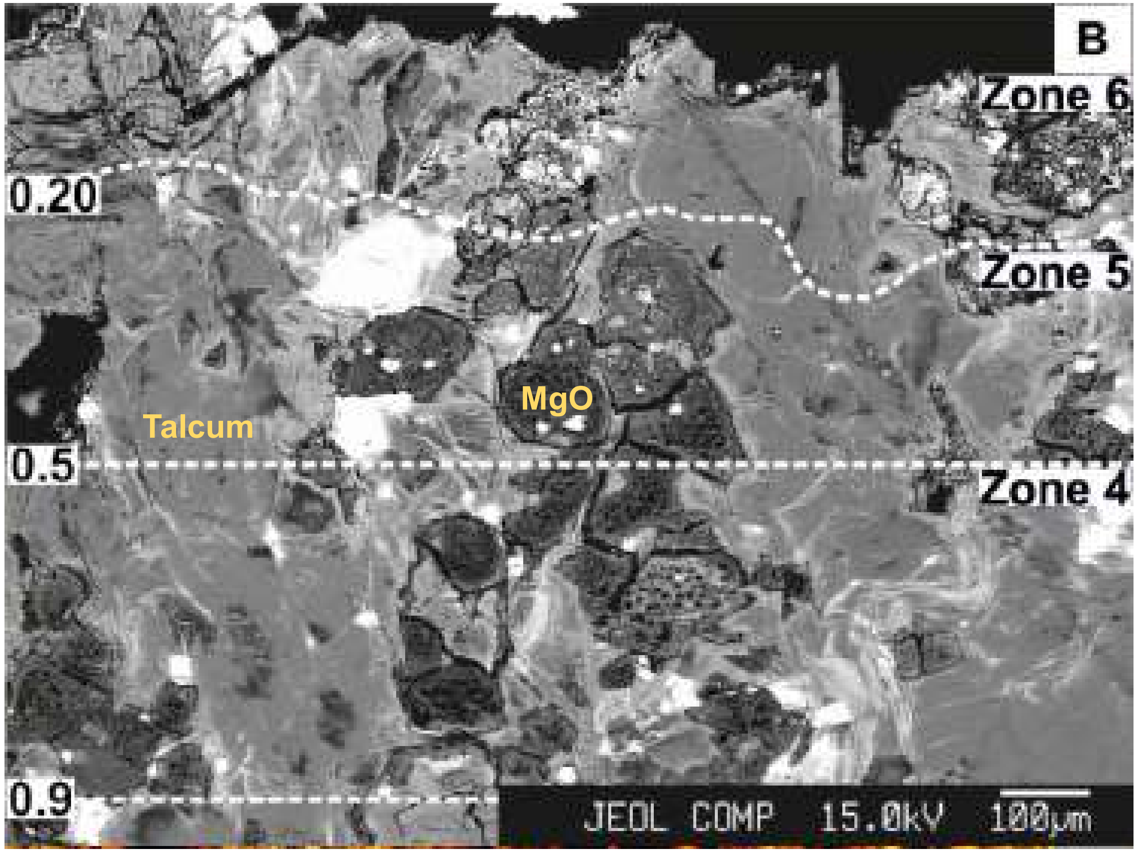


After repeated heating the layer of periclase gets harder. It sinters.

When talcum is affected to heat of heat the crystal water leaves from the borders of the talc grains.

Thus, the borders of talc transform into harder and non water containing magnesium silicate.

The areas in the middle of talc remain unchanged and flexible.

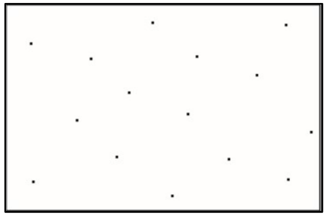


After magnesite has transformed into periclase (MgO), brucite will form into micro gaps diagonal and around the periclase.

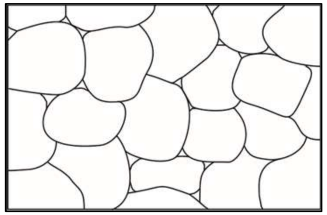
Extra to mineral content, different structures affect to characteristics of the soapstone

Different types of structuresin soapstones:

1. Grain size

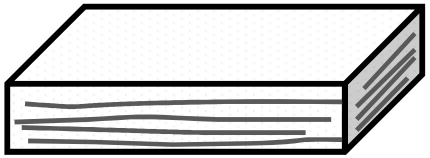


Fine grain

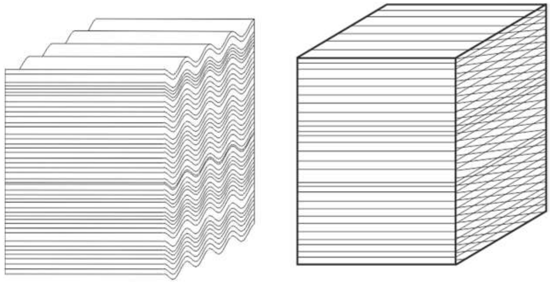


Rough grain

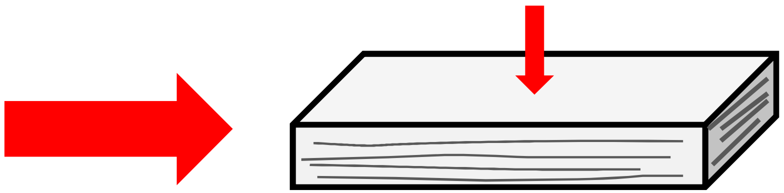
2. Planar foliated structures

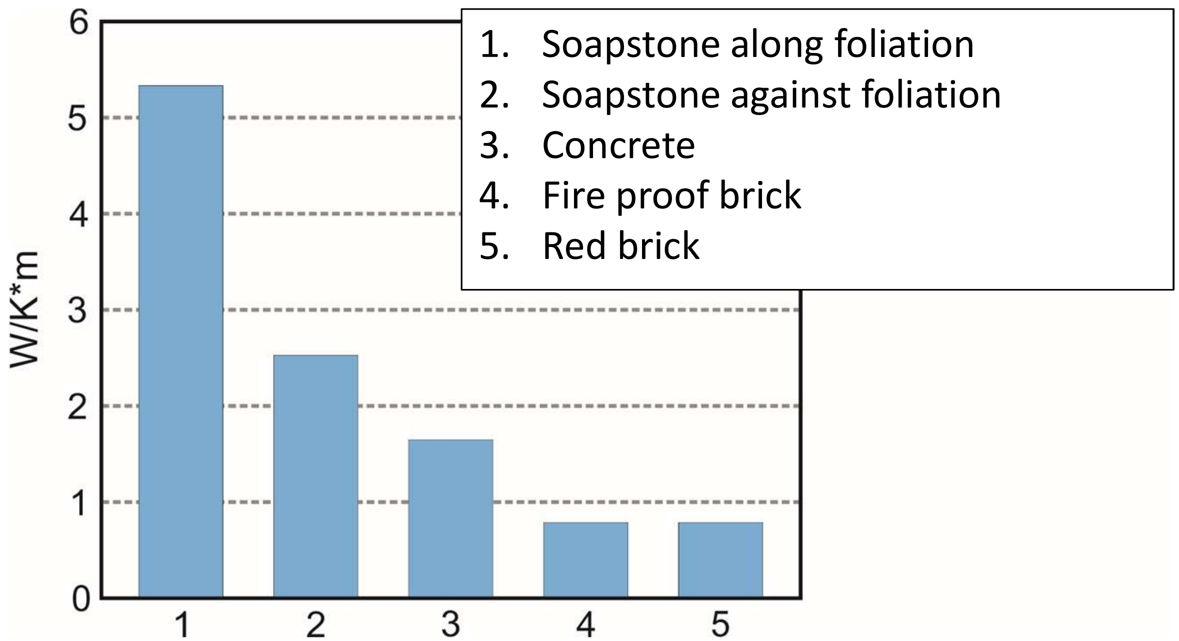


3. The length of compact foliated areas

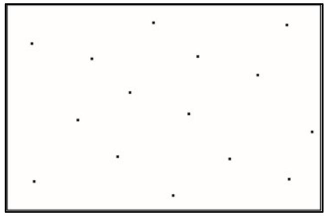


Heat conductivity



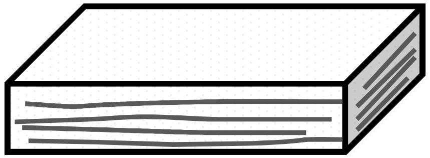


Heat durability



Fine granule
magnesite

+



Foliated
talcum

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The Mammutti soapstone is magnesite soapstone which is well foliated and has mostly a small grain size

Using the Mammutti soapstone

1. The fire chamber is built from fine-grained, oriented Mammutti soapstone. The direction of the foliation is chosen in a way that ensures the rapid transfer of heat into the deeper layers of the fireplace. A considerable portion of the generated heat is already captured for storage inside the fire chamber.

2.The direction of foliation within the smoke ducts corresponds to that found inside the fire chamber. This way, all of the remaining heat can be captured close to the fire chamber, making complete inner construction heat up evenly. Hence, in relation to its size, NunnaUuni stores a great amount of energy.

3.The surface layer is built using oriented Mammutti type of soapstone allowing heat to travel parallel to it. This, in turn, ensures that the entire fireplace structure radiates heat evenly into the surrounding room.

The Golden Fire

The Golden Fire burning method developed and patented by NunnaUuni is based on the precise direction of air, which ensures that exactly the right amount of air is used in the different phases of burning. The amount of oxygen remains exactly right during the different phases of heating

1. Combustion air is conducted into the space under the Golden Fire grate, either from the surrounding room or straight from outside the house.
2. A small portion of the combustion air is conducted under the embers through holes found in the Golden Fire grate to ensure that the gasification burning process continues smoothly and evenly.
3. Most of the preheated combustion air is conducted from the sides of the Golden Fire grate to the space around and above the logs where it serves as secondary air and ensures that the gases released evenly from the said logs burn at a high temperature of 800–1 200°C.

NunnaUuni Oy

From the articles belonging to the doctoral thesis.

A proposal for the definition, nomenclature, and classification of soapstones

Anne Huhta & Aulis Kärki

and

A new method for testing thermal shock resistance properties of soapstone – Effects of microstructures and mineralogical variables

Anne Huhta[1*], Aulis Kärki[2] and Eero Hanski[1]