



TEM INVESTIGATIONS OF NATURAL QUARTZ FOR TECHNOLOGICAL SOLUTIONS

MOTIVATION:

High purity quartz (a crystalline form of SiO_2) is a remarkable material, widely used in industry today. Due to combination of specific conditions it is found only in a few locations in nature. Quartz has high chemical purity and resistance, high softening temperature and thermal resistance, low thermal expansion, high transparency and high irradiation resistance.

The Quartz Corp (TQC) is a major supplier of high purity quartz sand from the source of the worlds purest quartz in Spruce Pine (USA). The mineral is mined in the US and shipped to Drag in Norway for further purification processing. The processed quartz is sold to a wide range of customers all over the World. Quartz sand produced by TQC can for example be found in

- Crucibles for Si Solar PV production
- Semiconductor crucibles, glass windows, rods, tubes
- Optical fibers
- Optical lenses



The quartz sand is very pure after the processing, however, ~ 10 ppm of other elements than Si and O is still present in the material. These elements come from small inclusions of other minerals or other types of elemental inclusions, lattice bound or interstitial placed atoms. In order to be even better in processing the sand to top quality and extreme purity, detailed knowledge of the material down to atomic scale is needed. The topic of the student project will be investigations of quartz material by transmission electron microscopy (TEM) techniques, to understand more of the remaining impurity elements in the material.

WHAT THE STUDENT WILL DO IN THE PROJECT:

The student will learn the basics of TEM specimen preparation and analysis, developing procedures to address the task and interpreting the results. The student will also be introduced to the world of quartz by TQC as a background for the experimental work to be executed. Quartz materials for study will be provided by TQC.

REQUIRED FROM THE STUDENT:

Background in materials physics (solid state physics) and interest in materials science would be an advantage. The student should be interested in experimental laboratory work using the TEM, and learning new practical skills. The student should take an active role with respect to putting the observations in to quartz material context, and need to obtain knowledge about quartz and quartz sand processing through this project.

OTHER ASPECTS:

There are possibilities for a summer job with The Quartz Corp in relation to the project.

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