SYNTHESIS AND STRUCTURAL EXAMINATIONS ON LTA-TYPE ZEOLITE

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Zeolites were just curiosity for a long time, but nowadays the usage of their names is increasing, and zeolites become very important materials in environmental issues and industry. Why did that change? As usual, the main progress in the knowledge on zeolites was the successful structure determination.

Zeolites have a complex alumosilicate framework structures. These frameworks are opened with large channels and interconnected cages. We can use zeolites in gas and petroleum industry, water softening, sewage treatment, agriculture, paper production, radioactive waste treatment as well as construction materials too. The structural channels and voids are occupied by loosely bound cations and water molecules that we can remove and replace without disrupting the tetrahedral framework. This means that a zeolite structure is among the best candidate to perform cation exchange, adsorption molecular sieving (passing a gas or liquid through a zeolite), dehydration and rehydration processes, in addition it can be resistant to high energy radiation too (TSCHERNICH, 1992).

The present work focuses on preparation and structure determination of sodalite-related zeolites using X-ray and electron diffraction techniques. I synthetized LTA-type zeolite crystals from metakaolinite starting material with alkaline (NaOH) method. Then I replaced Na^+ with Cs^+, and measured the resulted structural changes, using X-ray powder diffraction.

The LTA crystals revealed cube and sphere shapes under scanning electron microscope. X-ray powder diffraction measurements on Na-LTA, acid treated LTA and Cs-LTA were performed. The hkl and intensity data sets were the inputs for structure determination using the SIR (Semi Invariant Reconstruction) and SHELX program packages. Due to overlapping reflections, some sample resulted in high R factor values. However, the resulted LTA-type framework proved to be evident.

TSCHERNICH, R. W. (1992): Zeolite of the world. Geoscience Press Inc., USA.