

## Physico-chemical properties and application possibility of nano-sized lithium orthosilicate powders

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Lithium orthosilicate ( $\text{Li}_4\text{SiO}_4$ ) is a material with a wide range of applications, due to adequate physical, chemical and mechanical properties at high temperatures. The powders and membranes can be used as carbon dioxide absorbents in fossil fuel industries [1]. The pebbles and pellets can be used as tritium breeder materials for nuclear fusion reactors [2]. The aim of this research was to investigate and compare the physico-chemical properties of the nanosized  $\text{Li}_4\text{SiO}_4$  powders.

The nano-sized powders were produced by means of plasma synthesis at Institute of Inorganic Chemistry (Riga Technical University, Latvia). The microstructure was analyzed by scanning electron microscopy (SEM). The chemical composition was investigated by powder X-ray diffractometry (p-XRD) and Fourier transformed infrared (FT-IR) spectroscopy. The melting temperature was determined by differential thermal analysis (DTA). The radiation stability was investigated by method of chemical scavengers (MSC) [3], electron spin resonance (ESR) spectroscopy and thermally stimulated luminescence (TSL) method, after irradiation with gamma rays and accelerated electrons. The chemisorption of water vapor and carbon dioxide was investigated by thermogravimetric analysis (TGA), after storage in air atmosphere with elevated humidity.

It has been determined that the nano-sized  $\text{Li}_4\text{SiO}_4$  powders has enhanced radiation stability, higher surface area and smaller grain size in comparison with other forms. Therefore, nanostructured ceramics possibly can be used as alternative carbon dioxide absorbent or tritium breeding ceramic etc.

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### References

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