



Contribution ID: 17

Type: Oral presentation

X-RAY INDUCED DEFECTS IN LITHIUM ORTHOSILICATE AND LITHIUM METATITANATE CERAMICS PREPARED USING SOLID STATE SYNTHESIS METHOD

Friday, 11 February 2022 16:30 (15 minutes)

Lithium orthosilicate (Li_4SiO_4) and lithium metatitanate (Li_2TiO_3) for radiation-induced defect studies have been made using numerous methods including sol-gel, melt-spraying, drip-casting and solid-state reaction process in order to evaluate radiation stability of material for application as tritium breeding ceramics in future thermonuclear fusion reactors [1,2]. Solid-state reaction process has many advantages, such as high yield and easy scalability [3], however, to confirm the radiation stability of the material synthesized using this method, the formation and accumulation of radiation-induced defect must be assessed.

In this study, Li_4SiO_4 , Li_4SiO_4 with additions of Li_2TiO_3 , Li_2TiO_3 powder samples obtained by solid-state synthesis route as well as mechanically mixed Li_4SiO_4 and Li_2TiO_3 powders were pressed into 10 mm pellets using manual hydraulic press at room temperature in air. Afterwards, the prepared pellets were irradiated with X-rays in high vacuum with pressure less than 10^{-2} Pa at room temperature using an X-ray tube with wolfram anode. Operating parameters are as follows: 40 kV, 10 mA, irradiation time 15 minutes, and pressed pellet distance from X-ray tube is approx. 15 cm. The total concentration of formed and accumulated X-ray induced defects was assessed using electron paramagnetic resonance (EPR) spectrometry and thermally stimulated luminescence (TSL) technique.

The obtained results show that Li_2TiO_3 had the lowest concentration of both EPR and TSL active X-ray induced defects. The concentration of TSL active defects in the Li_4SiO_4 pellets with additions of Li_2TiO_3 significantly exceeded those detected in Li_2TiO_3 , Li_4SiO_4 pellets and in mechanically mixed Li_4SiO_4 and Li_2TiO_3 samples. This study has been performed within the framework of the European Regional Development Fund (ERDF) project (application No. 1.1.1.2/VIAA/4/20/614).

References:

- [1] Stefanelli, E.; Vitolo, S.; Frano, R. Lo; Pesetti, A.; Aquaro, D.; Puccini, M. *Fusion Eng. Des.* 2022, 175, 113014.
- [2] Wang, Y.; Zhou, Q.; Xue, L.; Li, H.; Yan, Y. J. *Eur. Ceram. Soc.* 2016, 36 (16), 4107–4113.
- [3] Mandal, D.; Jadeja, M. C.; Sen, D.; Mazumder, S. *Fusion Eng. Des.* 2016, 112, 613–620.

Primary author: TOMELE, Madara (University of Latvia, Institute of Chemical Physics)

Co-authors: SEŅKO, Mareks; ZARIŅŠ, Artūrs; ZOLOTARJOVS, Aleksejs; BAUMANE, Larisa; KIZĀNE, Gunta

Presenter: TOMELE, Madara (University of Latvia, Institute of Chemical Physics)

Session Classification: Physical Chemistry

Track Classification: Fizikālās ķīmijas sēde