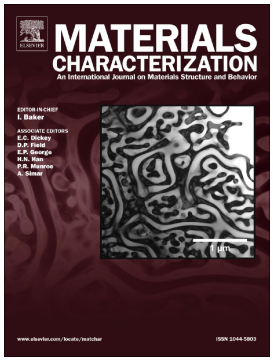

On the analysis and optimization of lithium-mica nano-crystallites using a statistical technique

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On the analysis and optimization of lithium-mica nano-crystallites using a statistical technique

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Abstract

The present research aimed to achieve optimum synthesis conditions through the fabrication of nano-crystalline lithium-mica glass-ceramics. An aqueous sol-gel route was applied to synthesize glass-ceramics, and X-ray diffraction (XRD) and transmission electron microscopy (TEM) were used for their characterization. At the same time, response surface method (RSM) was employed to record and analyze the influencing parameters. Heating temperature, stoichiometric deviation and amount of MgF_2 inclusion were considered as the effective parameters. "Design Expert" software could help to recognize the optimum conditions as follows: heating temperature = 662.1˚C, stoichiometric deviation = 0.66, and amount of MgF_2 = 6.95%.

The results indicated that an excessive increase or decrease in the synthesis parameters influenced the lithium-mica peak intensity negatively. Moreover, excessive increase or decrease in MgF_2 content led to the growth of mica crystallites, whereas increase in the heating temperature and stoichiometric deviation negatively and positively affected on the size of mica crystallites, respectively.

Keywords: ceramics; nanostructured materials; chemical synthesis; sol-gel processes; transmission electron microscopy; X-ray diffraction

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