Short Communication

Oriented texture of Y-doped $\text{La}_{10}\text{Si}_6\text{O}_{27}$ Ceramic prepared by rapid solidification method

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Oriented texture $\text{La}_{9.33}\text{Y}_{0.67}\text{Si}_6\text{O}_{27}$ ceramic was successfully synthesized by laser rapid solidification method. The $\text{La}_{9.33}\text{Y}_{0.67}\text{Si}_6\text{O}_{27}$ crystal was formed only after Yttrium was added into the $\text{La}_{10}\text{Si}_6\text{O}_{27}$ ceramic under the sintering of CO_2 continuous wave laser. As for pure $\text{La}_{10}\text{Si}_6\text{O}_{27}$, the oriented texture ceramic could not be sinterable directly. Even the $\text{La}_{10}\text{Si}_6\text{O}_{27}$ preparing by high temperature solid state reaction begins to decompose under laser sintering. The result shows that the suitable sintering laser power of texture $\text{La}_{9.33}\text{Y}_{0.67}\text{Si}_6\text{O}_{27}$ ceramic is 400W. Thermal expansion coefficient of $\text{La}_{9.33}\text{Y}_{0.67}\text{Si}_6\text{O}_{27}$ is $7.71 \times 10^{-6} \text{ K}^{-1}$, $7.76 \times 10^{-6} \text{ K}^{-1}$ and $7.83 \times 10^{-6} \text{ K}^{-1}$ at 600°C, 650°C and 700°C, respectively. The cell with textured $\text{La}_{9.33}\text{Y}_{0.67}\text{Si}_6\text{O}_2$ shows a better output power density than that of $\text{La}_{10}\text{Si}_6\text{O}_{27}$. The data suggest that the texture and lower thermal expansion $\text{La}_{9.33}\text{Y}_{0.67}\text{Si}_6\text{O}_{27}$ ceramic could be prepared by Yttrium substitution using laser sintering for the high oxide ion conduction.

Keywords: Ceramic; Texture; Laser sintering; Lanthanum silicate; Thermal expansion coefficient

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