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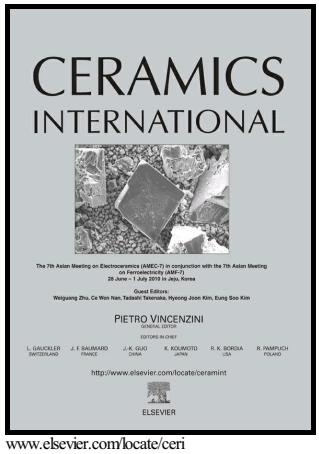

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Solid-phase combustion synthesis of calcium aluminate with $CaAl_2O_4$ nanofiber structures

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Abstract: Calcium aluminate with $CaAl_2O_4$ (CA) nanofiber structures was fabricated through a facile solid-phase combustion synthesis method with raw materials of CaO_2, $CaCO_3$, Al, and Al_2O_3 in Ar atomosphere at a pressure of 0.1MPa. The results indicated that the relative content of CA decreased, but that of $Ca_{12}Al_{14}O_{33}$ ($C_{12}A_7$) increased with the increase of *r*-value from 0 to 0.5 (*r* is molar substitution coefficient of $CaCO_3$ for CaO_2). Interestingly, CA nanofibers with tens of micrometers in length and about 200 nm in diameter were observed in the combustion products with *r*=0.2, 0.3, 0.4, respectively. The more nanofibers can be found in the products, as the content of $CaCO_3$ in raw material ratios increased. And the yield of nanofibers in the combustion product with *r* =0.4 is the highest. The typical round droplet on head of nanofiber indicated that the growth process of nanofibers was governed by vapor-liquid-solid (VLS) mechanism with base growth mode. It is proposed that both higher reaction temperature and reducing atmosphere are requirements for the growth of CA nanofiber during the process of combustion synthesis. The nanofiber cannot be generated in the samples r0, and r5, because the gaseous Ca is absent due to oxidizing atmosphere and lower reaction temperature, respectively.

Keywords: calcium aluminate; nanofiber; solid-phase combustion synthesis

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