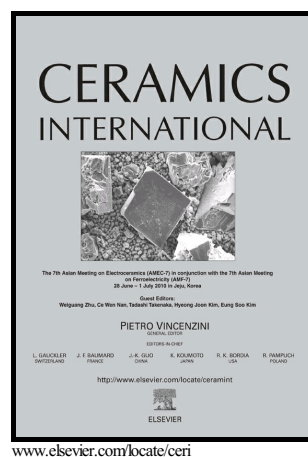


Solid-phase combustion synthesis of calcium aluminate with CaAl_2O_4 nanofiber structures

Shoulei Yang, Guoqing Xiao, Donghai Ding, Yun Ren, Lihua Lv, Pan Yang, Jianying Gao



PII: S0272-8842(18)30004-X
DOI: <https://doi.org/10.1016/j.ceramint.2018.01.003>
Reference: CERI17135

To appear in: *Ceramics International*

Received date: 16 November 2017
Revised date: 28 December 2017
Accepted date: 2 January 2018

Cite this article as: Shoulei Yang, Guoqing Xiao, Donghai Ding, Yun Ren, Lihua Lv, Pan Yang and Jianying Gao, Solid-phase combustion synthesis of calcium aluminate with CaAl_2O_4 nanofiber structures, *Ceramics International*, <https://doi.org/10.1016/j.ceramint.2018.01.003>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

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

Shoulei Yang^a, Guoqing Xiao^a, Donghai Ding^{b,*}, Yun Ren^a, Lihua Lv^a, Pan Yang^a, Jianying Gao^{a,b}

^aCollege of Materials and Mineral Resources, Xi'an University of Architecture and Technology, Xi'an 710055, China

^bKerneos Research Center Asia, Kerneos (China) Aluminate Technology Co. Ltd, Tianjing, 300457, China

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 atmosphere at a pressure of 0.1MPa. The results indicated that the relative content of CA decreased, but that of $\text{Ca}_{12}\text{Al}_{14}\text{O}_{33}$ (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 r_0 , and r_5 , because the gaseous Ca is absent due to oxidizing atmosphere and lower reaction temperature, respectively.

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

* Corresponding author,

Email: dingdongxuat@163.com

Download English Version:

<https://daneshyari.com/en/article/7887686>

Download Persian Version:

<https://daneshyari.com/article/7887686>

[Daneshyari.com](https://daneshyari.com)