

## عنوان مقاله:

CALCIUM ALPHA SIALON AS A PROMISING MATERIAL FOR ALUMINUM INDUSTRY: NANOPOWDER  
SYNTHESIS AND PRESSURELESS SINTERING

## محل انتشار:

اولین همایش بین المللی و ششمین همایش مشترک انجمن مهندسی متالورژی ایران (سال: 1391)

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## خلاصه مقاله:

A polyacrylamide hydrogel route was successfully developed for the preparation of Ca- $\alpha$ -SiAlON balls composed of nanoparticles with the stoichiometric composition of Ca<sub>1</sub>Si<sub>9</sub>Al<sub>3</sub>O<sub>1</sub>N<sub>15</sub>. An aqueous solution was first made containing the complex cations and nano silica. This aqueous solution was then gelled to a three dimensional (3D) tangled network, i.e. polyacrylamide hydrogel. The gel was dried and obtained xerogel was calcined under N<sub>2</sub> flow up to 1450 °C for 1h. The Ca- $\alpha$ -SiAlON phase was formed during carbothermal reduction and nitridation (CRN) process. In this work pre carbon polymer/nano silica/Al<sub>3</sub><sup>+</sup>/Ca<sub>2</sub><sup>+</sup> mixture was used as a new type of precursor. Due to homogeneity of mixture constituents at molecular level, the soaking time of optimal synthesis condition was reduced to 1h. FESEM investigation of the resultant powder showed that ball-shaped Ca- $\alpha$ -SiAlON was obtained at 1450 °C after 1h. It was found that very fine nanoparticles (> 30nm) were formed on the surface of the balls after CRN process. Moreover, the ball-milled nanopowder was sintered under N<sub>2</sub> atmosphere by pressureless sintering (PLS). This nitride ceramic exhibits high Vickers hardness (13.5 GPa) and proper fracture toughness (4.82 MPa m<sup>1/2</sup>). These all imply that Ca- $\alpha$ -SiAlON ceramics are promising candidate for aluminum industry.

## کلمات کلیدی:

Ca- $\alpha$ -SiAlON; Nanoparticles; Polyacrylamide; Hydrogel; Aluminum industry; Carbothermal reduction and nitridation (CRN) process

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