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Preparation of $MgAl_2O_4$ nanopowders via hydrolysis of double magnesium-aluminum isopropoxide

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Magnesium aluminate spinel ceramics is promising optical material for industrial and military applications due to its high hardness, melting point, thermal conductivity and high optical transmission in the ultraviolet, visible, and infrared spectral ranges. The properties of such ceramics are significantly determined by the characteristics of the starting powder: its stoichiometry, morphology and crystallite size. This work is devoted to the development of $MgAl_2O_4$ nanopowders fabrication technique via alkoxotechnology using double magnesium aluminum isopropoxide ($MgAl_2(OPr^i)8$) as the precursor. $MgAl_2(OPr^i)8$ was synthesized by interaction of activated magnesium-aluminum alloy with isopropyl alcohol. Since the precursor is a volatile compound, vacuum distillation method was successfully used for its purification and the possibility of high pure powders synthesis from starting technical pure grade materials were demonstrated. According to ICP-AES analysis the main impurities in synthesized $MgAl_2(OPr^i)_8$ are Si (9 ppm), Fe (0.39 ppm), Na (0.35 ppm), Zn (0.36 ppm). The content of the rest elements is below the detection limit. The hydrolysis of $MgAl_2(OPr^i)_8$ was performed by azeotropic mixture isopropyl alcohol – water (ratio 88:12 vol. %) with equimolar ratio 1:8. Magnesium aluminate spinel powders were obtained by calcining the hydrolysis products at 900°C. The powder particles are spherical with the average size of 30-50 nm and aggregated into soft agglomerates up to 50 μm in size. The resulting powders were used to sinter $MgAl_2O_4$ ceramic by hot pressing at a temperature of 1600°C and pressure of 50 MPa in graphite dies. Optical transmission of obtained transparent samples is more than 80%.

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Separation of monounsaturated and saturated fatty acids from oil seeds of *Jatropha curcas*

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Urea complex fractionation is a common method used to separate a mixture of FAs based on the saturation properties FAs. Optimum conditions of the experiment to obtain maximum percentage of MUFA (OA) (56.01%) was observed for sample treated with a urea-to-FAs ratio (w/w) of 3:1 at 10°C for 16 h. The lowest percentage PUFA (LA) (8.13%) was incorporated into the UCF with a urea-to-FAs ratio (w/w) of 1:1 at 10°C for 8 h. All of the above mentioned factors have to be controlled to yield a reasonable yield% of product with a desirable purity of FAs.

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