The effect of mechanical milling on the agglomerate size reduction was studied in a mixture of bohemite and magnesium nitrate nanopowder synthesized by sol-gel that is used to produce magnesium spinel. The initial powder was analyzed by XRD, SEM and particle size distribution (PSD). Quasi-spherical nanoparticles of 30-50 nm were obtained with an average agglomerate size distribution of 28.9 μm. Dry and wet low energy millings were performed to analyze the effect in the agglomerates average size. Both, dry and wet millings were performed with alumina balls of 1.5 mm with a balls powders ratio of 10:1 wt % in a propylene container. Dry milling was performed at 1, 2, 3, 6, 18, 21, 24 and 48 h. Wet milling was performed with a balls-powder ratio of 10:1 % wt in a liquid media of ethanol, acetone or water for 24 h. After wet milling the powders were dried by rotary evaporator at 45°C in vacuum, and a final dry milling of 1 h was performed to homogenize the powder. Mechanical dry milling showed to be an efficient method to reduce the agglomerates size even at the first hour (23.2 μm). Long milling times do not have a beneficial effect. Wet milling in ethanol and water showed a high agglomerates size increasing with 123.7 μm and 216.7 μm respectively. Acetone showed a reduction of the agglomerates size to 11.9 μm. The best result was obtained with dry milling at 24 h (17.1 μm).

Keywords: Nanopowder, Mechanical milling, Particle size distribution

References:


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