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Mechanical alloying, sintering and characterization of Al_2O_3-5 wt% Cu nanocomposite

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Al_2O_3 5 wt.%-Cu nanocomposite powder was synthesized by mechanical alloying method using a planetary ball mill up to 20 h. The properties of the milled powders were studied by X-ray diffraction (XRD) technique and transmission electron microscopy (TEM). Then, the milled powders were cold pressed and sintered at different temperatures for 1 h in argon atmosphere. The relative density and the apparent porosity of the sintered samples were measured. Scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS) was employed to investigate the microstructure of the sintered samples. Microhardness and fracture toughness of the sintered composites were also measured. The effect of milling time on the properties of the prepared powders and sintered samples were studied. The results revealed that the Cu particles were uniformly distributed in the Al_2O_3 matrix and covered the Al_2O_3 matrix after 10 h of milling. The crystal and the particle sizes were decreased with increased milling time while lattice strain increased. The relative density of the sintered samples exhibited a remarkable increase with the increase of milling time and sintering temperatures. Results also pointed out that the microhardness increased while the fracture toughness slightly decreased with the increasing of milling time.

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Potentiality of clay raw materials from gram area (Northern Tunisia) in the ceramic industry

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The geological study of Miocene clays from Gram area, North West of Tunisia shows an important series of clay materials to use them in the faience ceramic. Selected samples were studied with the objective of analyzing their chemical and mineralogical composition, morphology, particle size, plasticity, thermal analysis and their ceramic aptitude to be used in the faience ceramic. Raw materials are mainly composed of illite and kaolinite are the dominant clay minerals with minor quartz and dolomite. The plasticity indexes are lower than 15.40%, suggesting that these clays are not plastic. Technical characterization was carried out on one representative mixture of Miocene clay samples. The firing characteristics (shrinkage and water absorption) were measured. The optimum firing temperature of clay mixture (M) has been established. These clays could be used in the manufacture of ceramic pieces.

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