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Lightweight Ceramics from Clay and Ground Corncobs

Authors : N.Quaranta, M. Caligaris, R. Varoli, A. Cristobal, M. Unsen, H. López

Abstract : Corncobs are agricultural wastes and they can be used as fuel or as raw material in different industrial processes like cement manufacture, contaminant adsorption, chemical compound synthesis, etc. The aim of this work is to characterize this waste and analyze the feasibility of its use as a pore-forming material in the manufacture of lightweight ceramics for the civil construction industry. The characterization of raw materials is carried out by using various techniques: electron diffraction analysis X-ray, differential and gravimetric thermal analyses, FTIR spectroscopy, ecotoxicity evaluation, among others. The ground corncobs, particle size less than 2 mm, are mixed with clay up to 30% in volume and shaped by uniaxial pressure of 25 MPa, with 6% humidity, in moulds of 70mm x 40mm x 18mm. Then the green bodies are heat treated at 950°C for two hours following the treatment curves used in ceramic industry. The ceramic probes are characterized by several techniques: density, porosity and water absorption, permanent volumetric variation, loss on ignition, microscopies analysis, and mechanical properties. DTA-TGA analysis of corncobs shows in the range 20°-250°C a small loss in TGA curve and exothermic peaks at 250°-500°C. FTIR spectrum of the corncobs sample shows the characteristic pattern of this kind of organic matter with stretching vibration bands of adsorbed water, methyl groups, C–O and C–C bonds, and the complex form of the cellulose and hemicellulose glycosidic bonds. The obtained ceramic bodies present external good characteristics without loose edges and adequate properties for the market requirements. The porosity values of the sintered pieces are higher than those of the reference sample without waste addition. The results generally indicate that it is possible to use corncobs as porosity former in ceramic bodies without modifying the usual sintering temperatures employed in the industry.

Keywords : ceramic industry, biomass, recycling, hemicellulose glycosidic bonds
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