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Synthesis and characterization of $MgCr_xFe_{2-x}O_4$ spinel ferrites produced by the ceramic technique

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Magnesium–Chromium spinel ferrites with the general formula $MgCr_xFe_{2-x}O_4$ ($0 \leq x \leq 1$) were synthesized by the ceramic technique and characterized using X-ray diffraction, FT-Infra Red and Raman spectroscopy. From XRD diffraction patterns, the lattice parameters, bond length, crystallite size, density and porosity have been calculated and compared with those predicted theoretically. From FT-Infra Red band frequencies, the force constants K_t and K_o for tetrahedral (A) and octahedral (B) sites respectively, have been calculated and compared with the trend of bond lengths. For all compositions, Raman spectra show the five active modes $A_{1g} + E_{1g} + 3\ T_{2g}$ of the motion of O^{2-} ions and both the A-site and B-site ions. The trend of Infra Red and Raman frequencies with chromium content shows a blue shift for all modes consistent with the replacement of Fe^{3+} by lower mass Cr^{3+}.

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Potentiality of a frit waste from ceramic sector as raw material to glass-ceramic material production

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This work consists of studying the devitrification capacity of a residue from sodium-calcium frit, using the vitreous powder sintering method, which follows the traditional ceramic processing route, including a specific heat treatment to generate the appearance of crystals from the original glass phase. Initially the frit residue has been characterized by instrumental techniques such as XRF, XRD and DTA/TG. Furthermore, the chemical analysis (XRF) has allowed the prediction of devitrification potentiality of this residue by theoretical approaches represented by Gingsberg, Raschin-Tschetverikov and Lebedeva ternary diagrams. Then, this residue was subjected to traditional ceramic method, by changing the grinding time, the pressing pressure and prepared samples were obtained at different temperatures. In this part, the techniques for measuring particle size by laser diffraction and XRD and SEM to evaluate the generated crystalline phases, were applied. Finally, it has been found that this frit residue works as glass-ceramic precursor, devitrifying in wollastonite crystals as majority phase and without being subjected to the melting step of the glass-ceramic typical method.

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