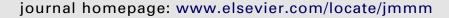


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## Low-temperature synthesis of nanocrystalline NiCuZn ferrite and the effect of Cr substitution on its electrical properties

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## ABSTRACT

In this study, nano-sized ferrites of compositions ( $Ni_{0.6}Cu_{0.20}Zn_{0.20}Fe_{2-x}Cr_xO_4$ ), where x=0-1.0, were synthesized through nitrate-citrate auto-combustion method at relatively low temperature. XRD revealed the formation of nano-sized ferrite particles with cubic spinel structure. An exception was obtained for samples with Cr content  $\leq 0.2$ , where weak diffraction peaks attributed to the presence of CuO and  $Fe_2O_3$  were appeared. The average crystallite sizes are much dependent on the chromium content and were found to decrease with its increase. The lattice parameter (a) slightly decreases with Cr substitution, which can be explained on the basis of the relative ionic radii of  $Cr^{3+}$  and  $Fe^{3+}$  ions. X-ray density was found also to decrease slightly with increase in chromium content, which indicates lower densification by the addition of Cr. FT-IR measurements show the characteristic ferrite bands. The Mössbauer spectra varied from Zeeman sextets to a relaxed doublet by increase in Cr content, which indicates a decrease in the hyperfine field at the octahedral site. Electrical property measurements revealed that  $Cr^{3+}$  ions do not participate in conduction process but limit the degree of  $Fe^{3+}$ – $O^{2-}$ – $Fe^{3+}$  conduction resulting in a decrease in the conductivity and increase in conduction activation energy.

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