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Physico-chemical studies on transition metal ferrites obtained from the thermolysis of transition metal tris(malonato) ferrate(III) precursors

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Transition metal ferrites of the type, MFe_2O_4 (M= Mn, Co, Ni, Cu) have been prepared from the thermolysis of their respective metal tris(malonato) ferrate(III) precursors, $M_3[Fe(CH_2C_2O_4)_3]_2 \cdot xH_2O$. The thermolysis of the precursors was monitored by Simultaneous Thermogravimetry-Differential, Thermogravimetry-Differential Scanning Calorimetry (TG-DTG-DSC) thermograms and the end products formed (MFe_2O_4) have been characterized by various physico-chemical techniques i.e., powder X-Ray Diffraction (XRD), Mossbauer and Transmission Electron Microscopy (TEM) studies. X-ray diffraction patterns of the final thermolysis products confirmed the formation of cubic inverse spinel ferrites. TEM analysis shows that these ferrite particles have diameters in the range 30-65 nm. The saturation magnetization values of the ferrites obtained from malonate precursors are lower than bulk values, which could be attributed to the decreased particle size, but higher than those obtained from their respective maleate/oxalate precursors. The magnetic properties of these nano sized ferrites make them strong contenders for their potential application in recording, micro-electronics and microwave devices.

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