

Low temperature synthesis of ferrites for LTCC applications

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Low temperature co-fired ceramics (LTCC) technology enables the integration of magnetic ceramics in the fabrication of high frequency and microwave devices, provided the magnetic materials achieve the desired properties at sintering temperatures as low as 800-900 °C. In order to obtain ferrites suitable for LTCC applications, soft chemistry methods are required. A modification of the citrate precursor synthesis route has been applied in spinel and hexaferrite compositions. The precursor gel is heated at 200 °C and, after the organic content is burned, it is fired at 600-800-1000 °C for 2 hours. XRD analysis shows that this method produces at a first stage single metal oxides and at higher temperature the mixed oxide. The microstructure and grain size has been examined by SEM and the crystallite size is compared to results from laser diffraction analyzer and to X-ray peak broadening through the Scherrer formula. Nano-sized, single-domain particles are formed (~40-60 nm), and grain growth is then dictated by the sintering temperature. VSM measurements have confirmed the development of the magnetic properties at 800 °C (eg. $M(@1T)=48,6$ emu/g, $H_c=435$ Oe for a Co spinel ferrite), and dielectric characterization of the samples has been performed at the 50Hz-5MHz range by means of an LCR bridge.