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Synthesis of lanthanum and neodymium dititanates from homogeneous hydroxide precipitation

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The need for electroceramics that can operate at high temperatures is rapidly increasing. Compounds with pervoskite layer structure (PLS) such as $La_2Ti_2O_7$ and $Nd_2Ti_2O_7$ are known to exhibit not only very high Curie temperatures of the order of 1500ºC but also show excellent piezoelectric properties that are suitable for high temperature transducer applications. Syntheses of $La_2Ti_2O_7$ and $Nd_2Ti_2O_7$ in polycrystalline form have already been reported in terms of mixed amorphous hydroxides, liquid mix techniques and sol–gel methods apart from conventional solid-state reactions of the oxides. Since chemical methods give good control over stoichiometry and yield phase-pure final products at relatively lower temperatures compared to conventional ceramic methods, an attempt has been made in this study to obtain coprecipitated precursors for lanthanum/neodymium and titanium starting from corresponding water-soluble salts. Use of potassium titanyl oxalate led to selective precipitation of lanthanum oxalate at all *p*H values thus precluding the formation of any complexes with TiO^{2+} ion. However, use of titanium tetrachloride with lanthanum nitrate facilitated formation of coprecipitated hydroxides which on thermolysis yielded phase-pure $La_2Ti_2O_7$ at 950ºC. Precipitates obtained from 1:1 equimolar aqueous solutions of La/Nd nitrate and potassium titanyl oxalate at different *p*H values were studied by TG and DTA methods while the phase identification of heat-treated samples was performed by XRD.