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PREPARATION AND CHARACTERIZATION OF THE La0.57Li0.30TiO3 (LLTO, X = 0.1) PEROVSKITE FOR SOLID STATE PH SENSOR

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Lithium lanthanum titanates (Lix La2/3-xTiO3 with x = 0.1 or LLTO) have been studied in the last decade as an alternative to the development of new in situ pH sensors in different harsh environments [1,2]. Despite the widespread possibilities of applications, the development of synthesis and processing routes of LLTO remains a challenging issue due of the structural complexity of this perovskite system. The standard solid state route for the powder and ceramics synthesis of the LLTO compound, employed as pH sensor devices, is based on multiple calcinations and grinding steps[2, 3]. This route ensures a higher degree of crystallinity and better electrical response in comparison with the sol-gel one [4]. The present work aims to establish an overview of the difficulties founded to obtain the single phase compound using a two step thermal treatment process powder synthesis, followed by ceramic sintering, as an alternative to the time consuming standard route (multiple thermal treatments). In the two step thermal treatment route, the powders were prepared by solid state oxide mixing method, calcinated at 850°C/4h, followed by a single thermal treatment at 1100 °C/12h. After each thermal treatment the powder was re-homogenized in vibratory mill. The powders obtained by the proposed new route were pressed isostatically at 200 MPa and sintered at temperatures varying from 1150 to 1350 °C/6h. All samples were characterized by X-ray diffraction, scanning electron microscopy and impedance spectroscopy. The single phase was obtained by both routes and ceramics up to 98 % of theoretical density were obtained by the two step process. Conductivities up to of 10-3 S/cm were obtained in ceramics prepared by the new route (sintered at 1250 °C). These results are in very good agreement with the ones reported in the literature, achieved by standard preparation method.