pH sensors with Lithium Lanthanum Titanate ceramic sensitive material

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Abstract

The lithium lanthanum titanates of the series $Li_{3x}La_{2/3-x}\square_{1/3-2x}TiO_3$ (LLTO), where $\square$ refers to cation vacancy, are studied in our Laboratory in reason of their high lithium conductivity linked to their crystallographic structure. A maximum value of conductivity ($\sigma = 10^{-3}$ S cm^{-1} at 300 K) has been reported for the composition x = 0.10. One practical application of an ionic conductor can be its use in an ion selective electrode i.e. LaF_3 for the detection of Fluoride ion in aqueous solution. Here the detection of Lithium ion in aqueous solution is not well achieved but we have found an other property : the sensors built with these materials react to the variations of pH in aqueous solutions like a glass electrode but with a SubNernstian slope (about 43 mV / pH unit at RT). The measurements domain is between pH=2 to pH=12.These type of sensors are interesting for the industrial control where the glass electrode can not be used in reason of its weakness. Like the glass electrode , the variation of the redox potential has no influence on the response of these sensors A thermal treatment analogue to a sintering permit to obtain more or less response to the pH variations. During the last two years, the influence of twelve different parameters was studied and we can obtain a good or no response to the pH variations. This second property permit to built ceramic–based reference electrode. The materials were prepared by solid state reaction or the sol-gel route. We present the mains results obtained in our Laboratory since four years with these new pH ceramic sensors.

Keyword : perovskite, Lithium ion conductor , sol-gel method, pH sensor
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