

Effect of Surfactant Concentration on Pore Arrangement of Mesoporous TiO₂ Thin Film and the Structure Stability of BaCeO₃ Proton Conductor in CO₂ Atmosphere

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The purposes of this project, we are planning to prepare the mesoporous TiO₂ for the application on solar cell. It is well known that nano TiO₂ powders were widely used as the electrode materials of dye-sensitized solar cell (DSSC) due to its high surface area. Comparing with the nano TiO₂ powder, mesoporous TiO₂ powder exhibits higher surface area and thermal stability than nano TiO₂ powders. In this project, we will prepare the mesoporous TiO₂ powder using P123 tri-block copolymer as the surfactant by EISA method. In addition, the mesoporous TiO₂ will be coated with nano MgO for investigation of the effect of the core-shell mesoporous TiO₂/MgO on the photo-electron properties. During the production process of TiO₂ electrode for DSSC, the TiO₂ will be heated to about 400~500°C to improve its adhesion and decrease the contact resistance.

In this study, the mesoporous structure of mesoporous TiO₂ were investigated. The X-ray diffraction data were collected using synchrotron radiations at NSRRC 13A1 beam line.

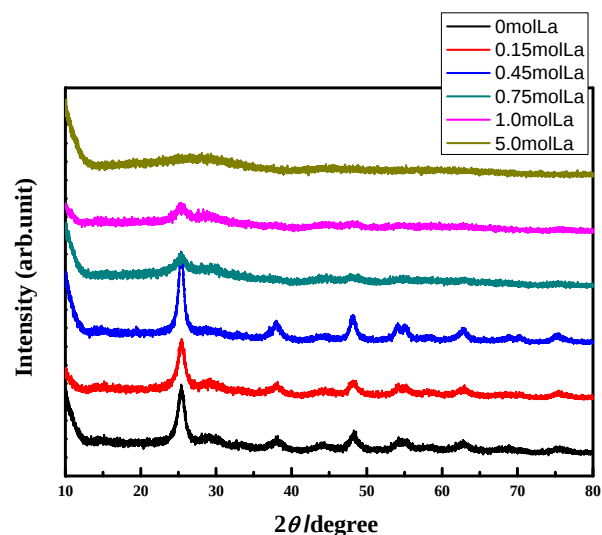


Fig. 2: WAXRD patterns of La/Ti mesoporous TiO₂ calcined at 380 °C.

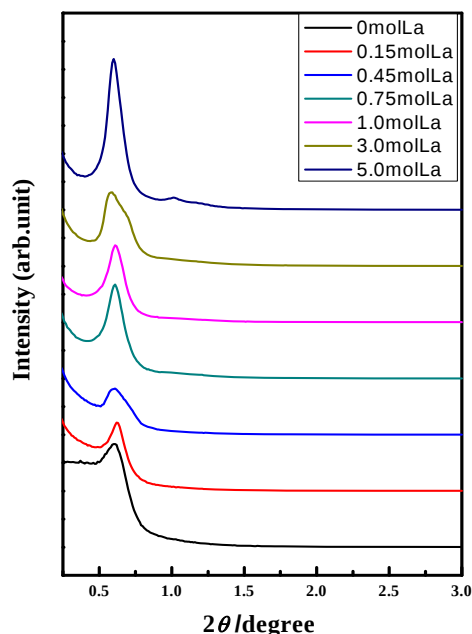


Fig. 1: SAXRD patterns of mesoporous TiO₂ prepared with various La/Ti ratio in NMP.

The pore arrangement of mesoporous TiO₂ prepared from different Ti/La ratio in 1-Methoxy-2-propanol (NMP) solvent were investigated and shown in Fig. 1. It was found that SAXRD peak of mesoporous TiO₂ is broaden and locates at 0.58°. The SAXRD peaks of La-doped mesoporous TiO₂ powders are more sharp than that of mesoporous TiO₂ that indicated that the pore arrangement of La-doped mesoporous TiO₂ is much more ordered than that of mesoporous TiO₂.

The wide-angle XRD peaks of mesoporous TiO₂ powders were shown in Fig. 2. It was found that the structure of mesoporous TiO₂ is anatase. The crystallite of TiO₂ decreases with doping amount of La element in TiO₂ increases. These results indicated that the La element will restrain the crystallite growth of TiO₂ and remain the ordered pore arrangement of mesoporous TiO₂ after high temperature heat treatment.