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Effect of pressure on crystal structure of metal oxides formed in supercritical CO_2 emulsified solution

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Metal oxides such as TiO_2 and ZnO are widely applied as biosensors, biomaterials and as the support in a drug delivery system because of the high biocompatibility. The synthetic approaches include hydrothermal methods, cathodic deposition, anodic oxidation and sol-gel method. Among them, cathodic deposition offers a low-cost yet effective process for production of metal oxides with controllable morphology. However, the as-deposited TiO_2 and SnO_2 are usually amorphous. An additional heat treatment process, for example, annealing at 400°C for 1 hr, is needed to obtain crystalline TiO_2. The need of the post-heat hinders the applicability of the products. Therefore, it is practically significant if crystalline metal oxides can be obtained directly from the cathodic deposition without the additional heat treatment, or lower the temperature needed in the heat treatment. On the other hand, the effect of pressure on the crystallinity of metal oxides deposited from the solution phase is rarely investigated. In a previous study, grain size of the TiO_2 cathodically deposited with a supercritical CO_2 (sc-CO_2) emulsified electrolyte (SCEM) was found to be increased with an increase in the pressure. In this later study, crystal structure of the TiO_2, ZnO, and SnO_2 were found to be affected by the applied pressure used during the deposition. The as-deposit TiO_2 and SnO_2 were found to be composed of nano-crystallines when the SCEM was applied. In this presentation, the effect of pressure on crystal structure of metal oxides deposited using the SCEM will be reported.

Biography

Tso Fu Mark Chang has received his BASc in Chemical Engineering from the University of Toronto (2004), MS in Chemical Engineering from National Tsing Hua University (2007) and PhD in Materials Science and Engineering from Tokyo Institute of Technology (2012). He is currently an Assistant Professor of Precision and Intelligence Laboratory at Tokyo Institute of Technology. His research interests include pressure and solvent effects on reactions in supercritical CO_2 and characterization of the materials fabricated in supercritical CO_2. He has published more than 50 papers in reputed journals.

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