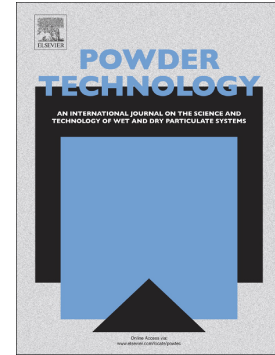


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Highly dispersed indium-tin-oxide nanoparticles synthesized using in-situ reverse reduction method and their application to transparent heater for extremely high temperature

Sung-Jei Hong^{1*}, Seung-Jae Cha¹, Jae-Yong Lee²

¹Display Materials and Components Research Center, Korea Electronics Technology Institute

#25, Saenari-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13509, Korea

Phone : +82-31-789-7431, Fax : +82-31-789-7439, E-mail : hongsj@keti.re.kr

²Hanchung RF Co. Ltd

#46-1 Gojan-ro 51beon-gil, Namdong-gu, Incheon, 21678, Korea

Abstract

In this study, indium-tin-oxide nanoparticles (ITO-NPs), synthesized using *in-situ* reverse reduction (ISR²) method, were highly dispersed in an ink. ISR² aims to reduce indium (In) and tin (Sn) ions dissolved in the HCl solution by putting it into the NH₄OH solution with the dispersing agent included. In-Sn hydroxides were uniformly precipitated with a smaller size by applying the ISR² method, and we confirmed ultrafine ITO-NPs of the sizes less than 10 nm after crystallization by heat-treatment at 400 °C. The ITO-NPs were well crystallized with cubic structure including (222) preferred orientation. BET specific surface area of the ITO-NPs was 95.47 m²/g, indicating that the average particle size was 8.75 nm. Balanced composition ratio of In to Sn (92.5 to 7.5 in weight) was made. In addition, the ITO-NPs were highly dispersed with a high zeta potential of 57.74 mV in absolute value when ink was formulated. Therefore, the ultrafine ITO-NPs were well made using the ISR² method. Moreover, the ITO-NPs were successfully applied to the transparent heater for the extremely

* Sung-Jei Hong; Corresponding Author (e-mail; hongsj@keti.re.kr)

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