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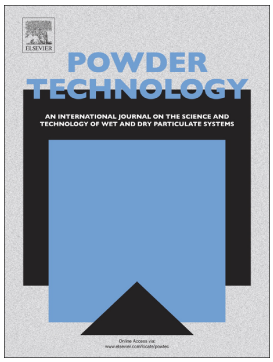

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Highly dispersed indium-tin-oxide nanoparticles synthesized using in-situ reverse reduction method and their application to transparent heater for extremely high temperature

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Abstract

In this study, indium-tin-oxide nanoparticles (ITO-NPs), synthesized using *in-situ* reverse reduction (ISR^2) method, were highly dispersed in an ink. ISR^2 aims to reduce indium (In) and tin (Sn) ions dissolved in the HCl solution by putting it into the NH_4OH solution with the dispersing agent included. In-Sn hydroxides were uniformly precipitated with a smaller size by applying the ISR^2 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 m^2/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 ISR^2 method. Moreover, the ITO-NPs were successfully applied to the transparent heater for the extremely

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