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Growth Mechanism of Indium Tin Oxide Whiskers Prepared by Sputtering

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Whisker structures of indium tin oxide were prepared on a glass substrate by conventional sputtering using an indium-tin alloy target. Whisker structures grew well at higher temperatures than the crystallization temperature of In_2O_3 and the melting temperature of the In–Sn alloy, and also under the sputtering conditions of comparatively scarce oxygen and a high sputtering rate. These sputtering conditions correspond to the transition mode of reactive sputtering. The whisker structures were categorized into a structure consisting of many needles and a structure consisting of many trunks with side branches. Each whisker was a bcc single crystal growing along the ⟨222⟩ direction and had a spherical droplet-like structure on the tip. Consequently, it was revealed that In–Sn droplets acted as important cores of whisker growth. The indium tin oxide (ITO) whiskers were grown by a self-catalytic vapor–liquid–solid mechanism promoted by the supersaturation of indium vapor.
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