

Phase equilibria and properties of transparent conductors in the indium-tin-zinc oxide system

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Abstract

Solid state bulk processing techniques were used to synthesize various transparent conducting oxides (TCO's) with In, Zn, and Sn cations. Optical and electronic properties of resultant phase-pure TCO's were compared to each other and to bulk samples of Sn-doped In_2O_3 (ITO). Redn. and heat treatment showed significant effects on optical and electronic performance, indicating optimization of processing conditions will be required for industrial applications. Comparison of optical and electronic properties in the series of compds.: $\text{Zn}_k\text{In}_2\text{O}_{3+k}$ $k = 3,4,5,7,11$ revealed trends correlated with the materials' internal structure. These layered compds. showed improvement of optical properties at higher Zn contents and improvement in cond. at higher In contents. The trends suggest these materials may be useful for applications where tradeoffs between cond. and transparency are acceptable.

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