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铝掺杂对ZnO:Al薄膜结晶性能与微观组织的影响

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摘 要： 以二水合醋酸锌为原材料，采用溶胶-凝胶浸涂法在钠钙玻璃基片上制备了具有*c*轴择优取向的ZnO:Al薄膜，考察了铝掺杂浓度对薄膜结晶性与微观组织结构的影响。结果表明：铝掺杂使ZnO薄膜(002)晶面的2θ向高角度方向偏移，*c*轴择优取向性增强，晶粒变小(15~20 nm)。当铝掺杂浓度(摩尔分数)为1%~2%时，微观组织结构变得致密均匀；当铝掺杂浓度大于2%时，发生颗粒团聚现象；在高掺杂浓度下(5%和8%)，出现大尺寸片状ZnO:Al晶粒异常长大，生长出特殊形貌的薄膜。

关键字： ZnO:Al薄膜；铝掺杂；溶胶-凝胶法；择优取向生长

Effect of Al-doping on crystallinity and microstructure of ZnO:Al thin films

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Abstract: Al-doped zinc oxide thin films with *c*-axis-preferred orientation were prepared on soda-lime glass substrates via sol-gel dip-coating route by using zinc acetate dihydrate as the starting materials. The effects of Al-doping concentration on the crystallinity and microstructure of the films were systematically studied. The results show that Al-doping benefits *c*-axis-preferred orientation and leads to 2θ of (002) plane shifting to higher angle. The grains with sizes of 15−20 nm are refined with increasing Al-doping concentration. A homogeneous dense microstructure is obtained when Al-doping concentration (mole fraction) is 1%−2% while there are particle agglomerations when the Al-doping concentration is above 2%. As for higher doping concentration (5% and 8%), the films exhibit the exceptional growth of l, arge plate-like crystals and grow into a special morphology.

Key words: ZnO:Al thin film; Al-doping; sol-gel; preferred orientation growth

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