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联氨浓度对化学溶池沉积ZnS薄膜的影响

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摘 要: 采用化学溶池沉积法在玻璃衬底上制备ZnS薄膜。为了解联氨在沉积过程中的作用, 采用金相显微镜、XRD、nkd-薄膜分析系统对薄膜形貌、结构和光学性能进行分析。结果表明: 随着联氨浓度的增加, 衬底表面形核点数目增加, 分布均匀, 薄膜颗粒得到细化。结合Zn²⁺的络合先驱体、络合常数及其三元络合常数计算、氢键及空间位阻等方面的分析, 认为会出现3种不同的络合先驱离子, 分别为 、 、 。这些 Zn²⁺的前驱体影响着衬底形核点的数目、分布与薄膜的均匀性。在适当条件下, 联氨不再起辅助沉积的作用, 而是与氨一起形成三元络合配位体系, 共同参与沉积。通过改变联氨浓度, 可以制备出在550~ 1 000 nm的波长范围内透过率达95%以上、反射率与透过率相对应、均匀平整的非晶薄膜。

关键字: ZnS薄膜; 化学水浴; 联氨浓度; 络合先驱体

Effect of N₂H₄ concentration on ZnS thin film prepared by chemical bath deposition

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Abstract: ZnS thin films were deposited on glass substrates by chemical bath deposition (CBD) method. The morphological, structural and optical properties of ZnS thin films were investigated by optical microscope, XRD and nkd-spectrophotometer. The results show that with N₂H₄ concentration increasing, the number of active points on the surface of substrate is improved and the grain size of thin films becomes smaller. At the same time, the uniformity of active points of

surface is improved. Combining the analysis of complex precursor of Zn^{2+} , the stability constant of ternary complex and its calculation, hydrogen bond with steric crowding of complex, there are three major precursors, such as , and , which influence the number, distribution of active points and the uniformity of thin films with increasing N_2H_4 concentration. The appearance of means that hydrazine is not also a usual complementary agent, it becomes a complex precursor of Zn^{2+} with amine. By changing the concentrations of N_2H_4 , the uniform, smooth and un-crystal ZnS thin films, whose reflectivity is larger than 95% at the wavelength ranging from 550 nm to 1 000 nm and the reflectivity spectra correspond well with their transmission spectra, can be obtained.

Key words: ZnS thin film; chemical bath deposition; N_2H_4 concentration; complex precursor

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