

光学元件与制造

比较2种溅射方法镀制的氧化硅薄膜

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摘要:

比较了磁控反应溅射(RMS)法与离子束反应溅射(RIBS)法沉积得到的氧化硅薄膜的光学特性,并确定了其对折射率n、消光系数k、沉积速率和混合工作气体Ar/O₂中氧含量的依赖性关系。工作气体中O₂含量大于15%时通过RMS法沉积的氧化硅薄膜在0.63μm波长折射率约为1.52~1.55,消光系数低于10⁻⁵。当O₂含量在80%以上时RIBS方法沉积氧化硅薄膜的折射率n=1.52~1.6,消光系数低于10⁻⁵。用RMS沉积SiO₂薄膜,当氧气量超过15%时发生反应模式,此时沉积速率下降近5倍。而用RIBS时,沉积速率并不依赖氧气在混合工作气体中的含量。

关键词: 磁控反应溅射 离子束反应溅射 折射率 消光系数

Comparison of reactive magnetron and reactive ion-beamsputtering for deposition of silicon oxide thin film

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Abstract:

The optical characteristics of silicon oxide thin films deposited by the reactive magnetron (RMS) method were compared to those deposited by the reactive ion-beam sputtering (RIBS) method. Dependence of refractive index n, extinction coefficient k and deposition rate on oxygen concentration in Ar/O₂ working gas mixture were determined. Silicon oxide films with the refractive index of 1.52~1.55 and extinction coefficient less 10⁻⁵ at the wavelength of 0.63μm were deposited by RMS method with O₂ content greater than 15% of working gas mixture. Silicon oxide films with refractive index of 1.52~1.6 and extinction coefficient less 10⁻⁵ were deposited by RIBS method with O₂ content more than 80% of working gas mixture. In the case of RMS method, the SiO₂ film deposition rate decreases almost 5 times when the process is switched to the reactive mode (more than 15% O₂). On the contrary, in the case of RIBS, the deposition rate does not depend on the O₂ concentration in the working gas mixture.

Keywords: reactive magnetron sputtering reactive ion-beam sputtering refractive index extinction coefficient

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