

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
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STUDY ON PROPERTIES OF SILICON OXYCARBIDE THIN FILMS PREPARED BY RF
MAGNETRON SPUTTERING TECHNOLOGY

Abstract

Silicon oxycarbide(SiCO) thin films are a kind of glassy compound materials, which possess many potential excellent properties such as thermal stability, big energy band, big refractive index and high hardness, and have many potential applications in space. The preparation processes of SiCO thin films synthesized by RF magnetron sputtering with different substrate temperature, working pressure or sputtering power were studied. And varied surface analysis methods were used to characterize the optical and mechanical properties of SiCO thin films. The dependence of the properties to the process parameters was else studied. The results of the properties SiCO thin films deposited on K9 glass indicated that lower substrate temperature and sputtering power, higher working pressure could get SiCO thin films with better light penetration and the refractive index of SiCO thin films had a large varied region with the change of the process parameters. With different substrate temperature, working pressure or sputtering power, the maximum refractive index at 633nm(wavelength) are 2.20051, 2.12072 and 1.98959 respective, and the minimum ones are 1.89426, 1.83176 or 1.8052 respective. The indentation hardness HIT of SiCO thin films on K9 glass had dependence on substrate temperature and sputtering power, and the rise of substrate temperature could enhance the indentation hardness HIT evidently. The indentation hardness of sample K2 and M2 which synthesized when substrate temperature was 473K was as high as 18.15, 13.20GPa respective. The results of the properties SiCO thin films deposited on Si(100) indicated that the refractive index of thin films also had a large varied region with the change of substrate temperature and sputtering power, while working pressure had less influence. The values of refractive index range from 2.264 to 1.991 and 2.235 to 1.856 with different substrate temperature and sputtering power respective. As same as the films on K9 glass, the indentation hardness HIT of SiCO thin films on Si(100) had great dependence on substrate temperature, and the indentation hardness of sample K1 and M1 which synthesized when substrate temperature was 473K was as high as 15.81, 12.88GPa respective. And sputtering power also had influence on the indentation hardness HIT of SiCO thin films on Si(100).