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Study of metalorganic layers deposited from Zirconium Tert-Butoxide/oxygen mixture in MMP-DECR low pressure plasma.Raphael Cozzolino¹, Yvan Segui², Patrice Raynaud²¹LAPLACE, Toulouse, France ²CNRS, Toulouse, France

raphael.cozzolino@laplace.univ-tlse.fr

Plasma deposition of metalorganic layer ($ZrO_xC_yH_z$) using zirconium tetra-tert-butoxide (ZTB) as a metalorganic precursor, alone or mixed with oxygen as an oxidant gas was investigated by using X-Ray Photoelectron Spectroscopy (XPS), Fourier Transform Infrared Spectroscopy (FTIR), Optical Emission Spectroscopy (OES) and Langmuir probe (LP). The plasma was created in a Microwave Multipolar reactor excited by Distributed Electron Cyclotron Resonance (MMP – DECR). The films were deposited at room temperature, the total pressure was 1mTorr (0.133 Pa), the microwave power range varied from 200 to 800 W and the oxygen ratio from 0% to 90%. The effects of process parameters such as ZTB/O₂ ratio and microwave discharge power on the growth rate and chemical bonding nature of thin films have been investigated. The deposits are amorphous and contain hydrocarbon parts. The results show that increasing both power and O₂/ZTB ratio permit to decrease the amount of hydrocarbon in the deposit. No change of the amorphous structure of the film has been found. However, for deposit with high O₂/ZTB ratio an interface closed to the surface sample has been detected. This interface contains more hydrocarbon than the rest of the deposit. The study of the interface vs process parameters as also been investigated. Correlation between plasma phase analysis and final composition and properties of the deposited films will be presented. This kind of process with such a metalorganic precursor allows to manage the refractive index in a large range.

Keywords

Plasma polymerisation
Microwave plasma
zirconium tert butoxide
structure and composition
optical properties