Microstructural characteristics and corrosion resistance of atmospheric pressure chemical vapor deposited SiO2 films from TEOS and O2.

S. Ponton* and F. Dhainaut, CIRIMAT and LGC, Toulouse, France ; H. Vergnes and B. Caussat, LGC, Toulouse, France ; D. Samélor, D. Sadowski and C. Vahlas, CIRIMAT, Toulouse, France

Abstract

Chemical vapor deposited SiO_2 films from tetraethyl orthosilicate (TEOS) is a key enabling material in numerous applications. Among the several pathways for the CVD of SiO_2 films from TEOS, the poorly investigated medium temperature process involving oxygen ensures a compromise between the high thermal load of the surface reaction of the TEOS pyrolysis process, and the strong activation of gas phase reactions in the ozone assisted decomposition of TEOS. It is a promising route towards conformal coverage of complex-in-shape structures, growth rate control, and appropriate physical & chemical properties of the coating.

SiO_x films are obtained from TEOS+O_2 in a horizontal CVD reactor operating at atmospheric pressure between 350 and 500°C. FTIR operating under normal and 55° incidence angle is used for the investigation of the structure, namely density, strain, oxygen content and stoichiometry of the films, by probing vibrational modes in the 900-1300 cm^{-1} region with well-resolved TO-LO phonon splitting. Complementary density values obtained by ellipsometry allow estimating the porosity of the films. Their corrosion resistance is investigated by the P-Etch test through thickness loss and is correlated with their composition, porosity and density.