Contribution ID: **3716** Type: **not specified**

P4.3021 Deposition and characterization of SiOx-like thin films from HMDSO mixtures plasmas

Thursday, 11 July 2019 14:00 (2 hours)

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.3021.pdf

Plasma polymerization of organosilanes is a valuable method for depositing both inorganicSiO2-like films, which have found many applications in microelectronics and optics, and polymer-like SiOxfilms, suitable for barrier films in food packaging and corrosion protection layers.In this work, SiOx-like films were deposited on silicon and on aluminum substrates startingfrom HMDSO as precursor with different reactive gases (O2and/or Ar) [1]. Thin film mor-phology depends on growth process, two different chemical vapour deposition techniques hasbeen employed: Plasma Assisted Supersonic Jet Deposition (PASJD) and Plasma EnhancedCVD (PECVD). The former is a technique which splits the deposition process into two steps:the precursor dissociation by a radio frequency (RF) inductively coupled plasma (ICP) and thenanoparticles acceleration and assembly on a substrate by means of a supersonic inseminatedjet [2]. The latter is one of the techniques allowing industrial-scale deposition of high-qualitycoatings. The reacting gases are also ionized by an RF inductively coupled discharge and thesubstrate is placed within a diffuse plasma region.Correlation between different operating conditions (such as the effect of HMDSO/O2ratio, totaltreatment pressure and growth time) and the resulting surface properties were also discussed.The structure and bondings in the deposited films were studied by means of Fourier transforminfrared (FTIR) spectroscopy. The thickness of the deposited films was deduced applying amask on the substrate and measuring the surface roughness with a mechanical profilometer.Films morphology and nano-structures were analyzed by scanning electron microscopy (SEM).Thermal annealing was performed, the effects induced on film composition and chemical struc-ture were therefore evaluated.The capability of controlling the film composition by varying operating conditions opens inter-esting perspectives. A potential research direction of this study worth exploring is to electro-chemically reduce the SiOx-like films to obtain a nano- or fine micro-structured surface layer,providing a novel Black-Silicon fabrication process.

References
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Presenter: CARRA, C.

Session Classification: Poster P4