

In-situ characterization of oxygen plasma surface etching/modification by Infrared-Visible Sum Frequency spectroscopy

Unlike many other techniques used to characterize surfaces under plasma exposure, Infrared-visible sum frequency (IVSF) generation is a surface specific probe molecular vibrations that can be carried in situ to follow molecular interactions and plasma initiated chemistry at the interface in quasi real time. We present an in-situ characterization of octadecyltrimethoxysilane monolayers and common industrial polymers (polypropylene, polyethylene, polystyrene) on Quartz in the presence of a DC oxygen plasma and an atmospheric pressure glow discharge using IVSF. Analysis is based on hydrocarbon lines in the IVSF spectra as a function of plasma exposure time, voltage and oxygen pressure. This test system will be used to demonstrate the unique advantages and limitations of IVSF as an in situ surface diagnostic in plasma systems.

This work was supported by the Division of Material Sciences, BES, Office of Science, U. S. Department of Energy and Sandia National Laboratories, a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.