Composition and Structural Studies of Strong Glow Discharge Polymer Coatings*

D.G. Czechowicz, A. Nikroo, and E.R. Castillo

General Atomics, P.O. Box 85608, San Diego, California 92186-5608

Thin walled, high-strength polymer shells are required in the production of direct drive targets for OMEGA cryogenic experiments. We have used FT-IR (Fourier Transform Infrared) absorption spectroscopy as a tool to better understand the processing conditions and characteristics of high-strength glow discharge polymer (GDP) coatings used for fabrication of thin walled GDP shells. Studies have shown that increasing the ratio of hydrocarbon to hydrogen gas during coating increases the CH absorption as measured by FT-IR, indicating higher hydrogen content. Coatings that have the greatest CH absorption are found to have the lowest buckle strengths; coatings having lower CH absorption are found to have higher buckle strengths. Analysis of FT-IR spectra indicates that different bonding structures are present in the GDP in addition to differing amounts of CH. The differences in structure have allowed us to relate processing conditions to coating characteristics. This has helped guide us during the development of high strength GDP shells. Fourier transform infrared spectroscopy has also been used to study changes that occur during aging of these GDP coatings. An increase in the presence of OH and CO bonding and a decrease in hydrogen concentration for GDP coatings upon long term storage in laboratory environments has been observed, probably due to reaction with oxygen and/or moisture. The rates of the chemical changes as a function of process parameters will be discussed.

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