

Abstract Submitted
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Low Temperature Plasma Surface Interactions: Atomic Layer Etching And Atmospheric Pressure Plasma Jet Modification Of Biomaterials*

GOTTLIEB OEHRLEIN, Materials Science and Engineering, Institute for Research in Electronics and Applied Physics, University of Maryland, College Park, MD 20742-2115 — Control of plasma-surface interactions is essential for successful application of low temperature plasma to materials processing. We review work performed in our laboratory in two areas: First, low pressure plasma surface interaction mechanisms aimed at achieving atomic precision in etching materials in the semiconductor industry. We discuss sequential reactions of surface passivation followed by directional low energy ion attack for “volatile product” removal to establish for what conditions self-limiting behavior required for Atomic Layer Etching (ALE) can be established using prototypical SiO₂ –Si/fluorocarbon-Ar materials/etching systems. Second, studies of plasma-surface interactions related to application of a non-equilibrium atmospheric pressure plasma jet (APPJ) for modification of biomaterials are discussed. Changes in surface chemistry/biological activity of lipopolysaccharide (LPS) exposed to the APPJ plume/effluent in a controlled environment are reviewed. The results clarify how jet chemistry and interactions of plasma with the environment impact the consequences of APPJ-biomaterial-surface interactions. *Based on collaborations with D. Metzler, S. Engelmann, R. Bruce, E. Joseph, E. Bartis, C. Hart, Q.-Y. Yang, J. Seog, T.-Y. Chung, H.-W. Chang, and D.B. Graves. We gratefully acknowledge funding from US Department of Energy (DE-SC0005105; DE-SC0001939) and National Science Foundation (CBET-1134273; PHY-1004256).

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