Argon Bombardment of Organic Films: How Much Does it Improve Bioimaging?

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Secondary ion mass spectrometry (SIMS) plays a unique role in the field of bioimaging. A beam of energetic ions is shot at a target, and molecules from the target are desorbed and available for analysis with sophisticated technology.[1] Recently, experiments using SIMS have used a beam of ion clusters, such as C_{60}^+, as opposed to a single atomic ion beam. This advance resulted in the unique ability to perform molecular depth profiling and 3D-imaging, experiments not possible with other techniques. Bombardment of organic material with C_{60} is often highly effective. However, sometimes the sputtering yield quickly drops to zero. This problem is attributed to the damage and carbon deposition on the surface that occurs with repeated C_{60} bombardment.[2] In a recent experiment, organic films were co-bombarded with C_{60} and a beam of low energy Ar, resulting in a higher, constant sputtering rate with less damage and carbon deposition than C_{60} alone.[3]

Our objective is to model Ar bombardment of organic solids, specifically benzene, with molecular dynamics simulations. Our first goal is to determine if Ar can help the sputtering process by ejecting intact molecules while minimizing damage. Our second goal is to assess whether Ar aids C_{60} by breaking up the new carbon-carbon bonds formed by C_{60} bombardment. Specifically, it is believed that C_{60} bombardment can create damage that is graphitic-like, that is, has a low hydrogen content.[4] Thus, in addition to modeling Ar bombardment of the benzene film, we also model Ar bombardment of graphite. Results of the simulations will be presented in the poster.

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3. B. Y. Yu, Y. Y. Chen, W. B. Wang, M. F. Hsu, S. P. Tsai, W. C. Lin, Y. C. Lin, J. H. Jou, C. W. Chu and J. J. Shyue, Analytical Chemistry **80** (9), 3412-3415 (2008).
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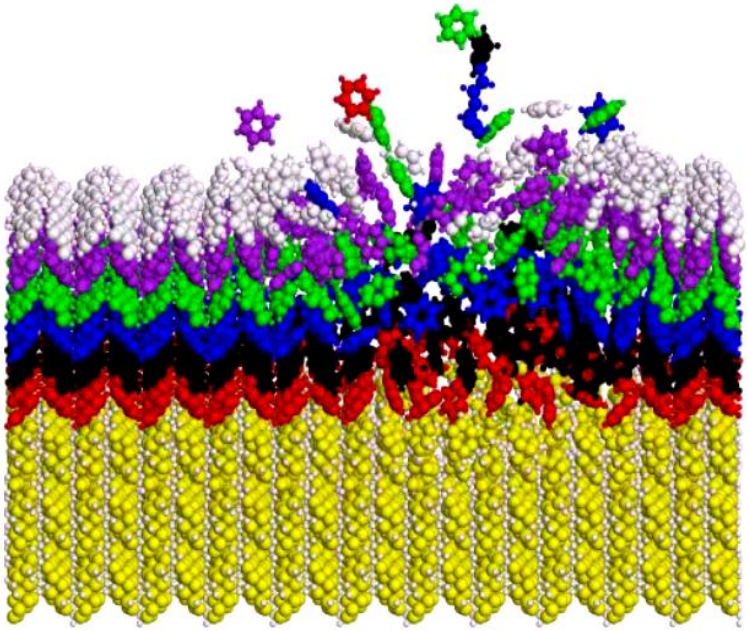

A benzene solid during 300 eV Ar bombardment. The benzenes are colored by layer.