HAJIM SCHOOL OF ENGINEERING AND APPLIED SCIENCES
UNIVERSITY of ROCHESTER

Department of Chemical Engineering presents

Dr. Salmaan Baxamusa

Staff Scientist
Lawrence Livermore National Laboratory

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"Material reliability in laser systems: from large optics to small targets"

At the heart of laser systems such as Omega (Laboratory for Laser Energetics, Rochester) and the National Ignition Facility (Lawrence Livermore National Laboratory) are the materials that must perform reliably while meeting the demanding experimental requirements of high energy density and inertial confinement fusion research. This talk will describe two examples of materials systems that are enabling experiments at both Omega and NIF.

Oxidative aging of chemical vapor deposition (CVD) polymers degrades their performance as laser targets. We have discovered an unusual photo-oxidation pathway in plasma CVD polymers and exploited it for several novel Omega experiments. In addition, we are developing oxidatively-stable polymers using initiated CVD.

Fused silica laser optics are prone to damage when a precursor absorbs light and initiates a runaway thermal process. We have found that a wide variety of materials, even those that are transparent bulk materials, can absorb light when bound to a fused silica surface. This key insight catalyzed the development of processes leading to a 1000× reduction in fused silica damage and we are working to extend this concept to crystalline optics.

Through these examples, this talk will show how fundamental material and chemical sciences deliver the robust materials that enable scientists to study some of most difficult experimental physics problems of today.

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