# Amorphous Thin Films and Their Impact in Laser Science

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Amorphous oxides are prevalent in photonic technologies. They are transparent from the near ultraviolet to the midinfrared and offer a large refractive index contrast with substrates like Si or among themselves, which is exploited to confine light. Stacks of amorphous oxide thin films offer enormous flexibility to engineer their optical response and thus are used to coat laser mirrors, lenses, and other components in complex laser systems. Although interference coating technology is well developed, there are applications that present a challenging environment to the state-of-the-art and which are driving research to advance these photonics structures to new performance heights and functionality.

In this talk I will describe results of extensive studies in amorphous thin film materials and in the engineering of multilayer dielectric coatings for two impacting laser science efforts: i) near infrared ultrahigh intensity chirped pulse amplification lasers and iii) gravitational wave detectors. For each of these applications the materials' problems that are being addressed are significantly different. In the former, the electronic structure, and nonlinear optical response of the metal oxides impacts high intensity laser-matter interactions. In the latter, the understanding and control of mechanical energy dissipation is paramount to engineer next generation coatings that will enhance the detection sensitivity of the gravitational wave detectors.