

**01-010**

**IN SITU MICROSCOPY: KEY TO FUNDAMENTAL UNDERSTANDING OF MATERIALS PHENOMENA**

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In situ microscopy enables direct visualization of surface morphological, compositional, and macro-, micro-, and nano-structural evolution of materials, and often reveals surprising and previously unknown aspects. In this talk, I will give an overview of a few of the materials phenomena that can be studied using surface and bulk characterization techniques such as in situ variable-temperature scanning tunneling microscopy (VT-STM), low-energy electron microscopy (LEEM), scanning and transmission electron microscopies (SEM and TEM), and optical microscopy (OM). Examples include: in situ STM and LEEM studies of two-dimensional graphene and hexagonal boron nitride (hBN) layer growth kinetics; in situ SEM and TEM studies of nanomechanical behavior of refractory transition-metal carbides; and in situ liquid-cell TEM and OM studies of electrodeposition of Zn dendrites