Molecular design for EUV photochemistry modulation.

S. Castellanos

By using a wavelength more than one order of magnitude shorter (13.5 nm), EUV lithography outperforms traditional ultraviolet lithography in terms of the achievable spatial resolution. However, the response of materials to such high-energy radiation (92 eV) is not generally understood, let alone controlled. The lack of detailed comprehension of how matter interacts with 92 eV light is a missing piece in fundamental science but also a major hurdle in the optimal utilization of EUV light for nanolithography applications.

In the EUV Photoresists group we design materials with well-known molecular structure in order to pin-point which variables in their molecular structures contribute to their lithographic performance. Materials based on inorganic components have proven very promising due to their enhanced absorption of EUV photons and to the chemical and mechanical stability of their patterns upon lithography exposure. To gain insights into how pattern formation works in inorganic-based photoresists, we use model hybrid compounds based on metal oxo-cluster cores. This type of compounds offers great versatility in their molecular design and thus enable the tuning of the material variables and the systematic study of their influence on the photoresist behavior. Furthermore, they allow for the tracking of the photochemical transformations they undergo by means of spectroscopic and materials characterization tools.