EUV Extendibility Research at Berkeley Lab

Patrick Naulleau, Center for X-ray Optics, Berkeley Lab

EUV Lithography will soon be replacing DUV immersion lithography in high volume production at the 7-nm node and beyond. With numerous 0.33 numerical aperture (NA) tools in the field, EUV has proven itself as technically extremely capable, yet availability remains a gating item for the insertion of EUV into high volume production. On the research and development front, the activity in EUV has now in large part shifted over to high numerical aperture (NA ≥ 0.5) EUV. High NA significantly stresses several current challenges and brings with it fundamentally new challenges. The most significant new challenge arises from angular bandwidth limitations of the mask multilayer requiring the use of anamorphic optics, or new multilayer material systems. The most significant extended challenge revolves around stochastics in photoresist materials and exposure processes. In this presentation I will be describing these challenges in detail as well as highlighting new research facilities and activities focused on addressing these emerging challenges.