

Direct testing of primary photo-electron energy generated by Extreme ultraviolet (EUV) at 13.5 nm

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In EUV resist modeling literature, photons irradiate the resist film causing it to photo ionize. It is assumed the primary photoelectron will have kinetic energy of about 80 eV which approximately equals to the photon energy minus the ionization energy. If such a scenario is true, subsequent events that result in chemical modification are solely due to the generated photoelectron. It is experimentally possible to irradiate the sample directly with an electron at 80 eV, and cause the same chemical changes as expected from EUV photon irradiation alone. It has previously been shown that the outgassing behavior or EUV irradiation and electron beam irradiation are comparable at clearance doses. This experiment will produce a photopolymer dissolution contrast curve for EUV and 80eV electron beam in a constant resist. Alternative process of electron-hole pair generation and Auger process has also been proposed. This experiment will help validate the photoelectron model proposed in literature. This knowledge can then be used to improve various commercial EUV photoresist modeling software packages.

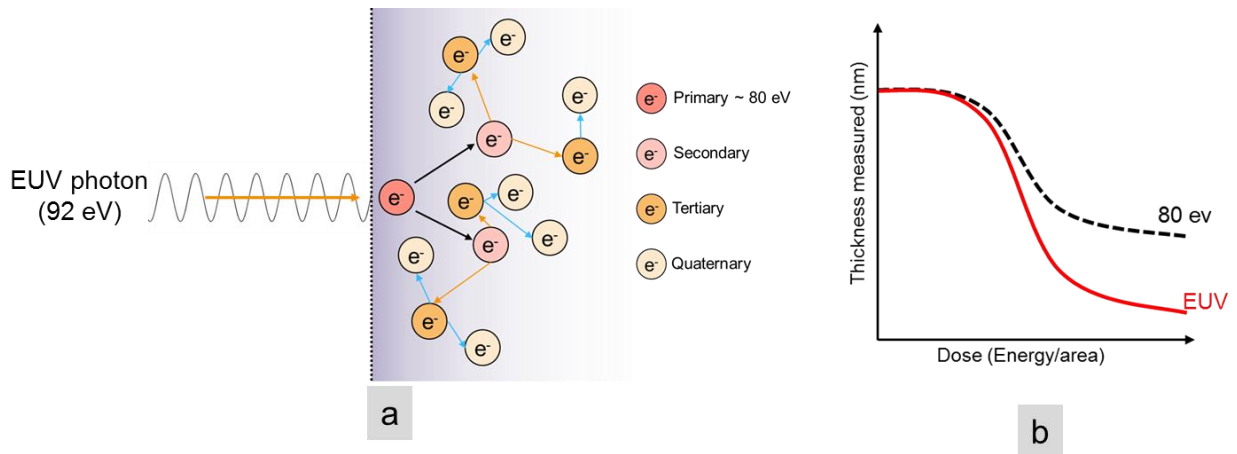


Figure 1: (a) Irradiation of photoresist with EUV photon ionizes one of many atoms which produces secondary/Tertiary/Quaternary electrons which subsequently participate in deprotonation of PAG molecules producing the contrast curve as shown in (b) which is the cartoon representation of what could be observed if proposed model for photoresist processes are true.