OXIDATION OF ORGANIC FILMS BY BEAMS OF HYDROXYL RADICALS

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We have studied the oxidation of self-assembled monolayers (SAMs) of alkanes and alkenes with a thermal beam of OH radicals. The target films are produced by bonding alkane thiols and alkene thiols to a gold surface and the SAMs are mounted in a vacuum chamber at a base pressure of 10^{-9} Torr. Hydroxyl radicals are produced by a corona discharge of a H_2O_2/water mixture. The resultant molecular beam is scanned by an electrostatic hexapole and the OH radicals are focused onto the target SAM. We are able to produce CW beams of OH radicals with a flux of roughly 3 ± 1 x 10^{11} OH radicals cm^{-2} sec^{-1}. We have employed reflection/absorption infrared spectroscopy (RAIRS) to monitor the reactivity of OH with an alkane and an alkene. RAIRS demonstrates that 3 min. dosing of an octadecane thiol SAM with OH radicals completely destroys the CH_3 groups at the surface. Oxidation of the undec-10-ene-1-thiol ($HS(CH_2)_9HC{=}CH_2$) SAM with the calibrated OH radical source consumes the terminal alkene, CH_2=CH, within 3 min.