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# Silicon Carbide and Oxide Layers Formed by Low Energy (5-100 eV) Ion Beam. Deposition and Spectroscopic Characterization

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We have employed low energy (5-100 eV) beams of $C^+$, $O^+$, and $CO^+$ ions to deposit carbide and oxide layers on a Si(111) surface under ultrahigh vacuum (UHV) conditions at room temperature. The deposited layers are characterized *in situ* by Auger electron spectroscopy (AES) and ultraviolet photoelectron spectroscopy (UPS). The effects of sputtering and thermal treatment on these layers are also examined. Atomic $C^+$ and $O^+$ ion beams efficiently produce carbide and oxide layers, respectively. Molecular $CO^+$ ions collisionally dissociate on the surface to form a mixed carbide and oxide phase, the dissociation yield for $CO^+$ increasing with beam energy in the range of 5-20 eV. It is found that the electronic energy gained during ion neutralization plays an extra role for $CO^+$ dissociation. Upon thermal annealing, the $O^+$-deposited layer changes into a more uniform phase. The thermal stability of a $CO^+$-deposited layer varies with incident beam energy, exhibiting higher stability when produced from a higher energy beam. Such beam-energy dependency can be attributed to deeper penetration of the carbon beams than oxygen, resulting in different depth distributions inside the layer.