

Sputtering by the Solar Wind: Effects of Variable Composition

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It has long been recognized that solar wind bombardment onto exposed surfaces in the solar system will produce an energetic component to the exospheres about those bodies. Laboratory experiments have shown that there is no increase in the sputtering yield caused by highly charged heavy ions for metallic and for semiconducting surfaces, but the sputter yield can be noticeably increased in the case of a good insulating surface. Recently measurements of the solar wind composition have become available. It is now known that the solar wind composition is highly dependent on the origin of the particular plasma. Using the measured composition of the slow wind, fast wind, solar energetic particle (SEP) population, and coronal mass ejection (CME), broken down into its various components, we have estimated the total sputter yield for each type of solar wind. Whereas many previous calculations of sputtering were limited to the effects of proton bombardment, we show that the heavy ion component, especially the He^{++} component, can greatly enhance the total sputter yield during times when the heavy ion population is enhanced. We will discuss sputtering of both neutrals and ions.