# Electron Ionization of $H_2O$ Ice on Lunar Surface Exposed to Solar Wind

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Moon, the Earth's only satellite is atmosphere-less, and is continuously immersed in the flow of energetic particles from the Sun, called solar wind. Recent revisit to the Moon Mineralogy Mapper (M3) instrument data, onboard India's Chandrayaan-1 confirms the presence of solid water-ice on the moon [1]. Here the ice is basically situated in the shadow of craters in the darkest and coldest parts of its polar region. And it is the interaction between solar wind and ice on moon which lead us to this study. The present work is based on the inelastic interaction of the solar wind electrons (along with secondary generated electrons) and water ice on moon polar cap region.

The basic problem that we consider presently is the microscopic electron impact ionization of water molecules in ice phase. We will report theoretical calculations carried out in this regard. The underlying scattering theory adopted here is the complex scattering potential – ionization contribution formalism, describing simultaneous elastic and inelastic scattering of electrons [2 and references there in]. Our calculations are also extended to estimate various macroscopic quantities like ionization mean free path, ionizing collision frequencies etc. Further we also wish to present the inelastic interaction of electrons with the dominant oxides on the surface of moon, i.e. $SiO_2$ and $Al_2O_3$ [3].

Detailed results will be presented during the Conference IPSC-2020.

**References:**[1] Shuai Li et al.,(2018) *Proceedings of the National Academy of Sciences,115 (36)* 8907-8912. [2] S. H. Pandya, F. A. Shelat, K. N. Joshipura & B. G. Vaishnav (2012) *Int. J. Mass Spectrom. 323-324*, 28; see also, K. N. Joshipura and N. J. Mason (2018) '*Atomic molecular ionization by electron scattering: theory and applications*' Cambridge University Press [3] S. H. Pandya, B. G. Vaishnav and K. N. Joshipura (2012) *Chin. Phys. B 21*, 093402.