ELECTRON INTERACTION WITH THE DRY ICE (CO_2 ICE) IN THE POLAR CAP REGIONS OF PLANET MARS.

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Introduction: The CO_2 rich planet Mars is always the centre of attraction amongst the planetary scientists, regardless of their working area, viz. ionospheric modeling, climatology, hydrology etc. In addition the present year 2013 is going to be a year of Mars missions with preparations afoot to launch an Indian Mars mission '*Mangalyaan*' and the US Mars mission 'MAVEN'.

Our present interest is in dry ice, as we noted that recently the planet Mars is found to have high altitude clouds containing dry ice [1]. Apart from the atmosphere, the ground polar cap regions of the Mars also possess significant amount of dry ice condensed above the water ice bed. Earlier Mars missions such as Viking, Mars Global Surveyor and Mars Odyssey observations revealed that the thickness of the dry ice in the north polar region was ~1 m as compared to ~8 m in the southern region during the winter season on the planet.

Further from the view point of chemistry, the suggested presence of pure CO_2 ice on Mars could modify the prediction of the loss of its atmosphere due to solar wind-induced sputtering. Also the presence of formaldehyde in Mars atmosphere can be explained by the electron and photon driven reactions of CO_2, Which is thought to be produced by the complex reactions involving CO_2 and H_2O [2].

This paper is perhaps the first ever attempt in this direction to study electron induced inelastic interactions in general and ionization in particular with CO_2 in ice phase.

Theory: A quantum mechanical approach [3-5] has been employed here to estimate the electron impact ionization cross section for the dry ice along the comparative study with its gaseous phase (CO_2). Cross sections of cumulative total electronic excitation and total ionization are calculated and compared mutually.

Aim: Since CO_2 is the most abundant constituent on Mars, it is of present interest to study the photoelection impact processes with the dry ice. Particular interest is on electron impact ionization process, which leads to the production of various ionized and neutral species in the Martian atmosphere and further gives rise to the complex chemistry.

With the above mentioned theoretical background we aim to work out as follows, in relation to the Martian polar cap regions.

i) To calculate the microscopic ionization cross sections for CO_2 ice as well as for gasious CO_2,

ii) To employ these microscopic quantities to calculate ionization mean free path (MFP) in the Dry ice,

Detailed results and discussions will be presented during the Conference.

References:

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