Laboratory investigations of molecular hydrogen formation on dust grain analogues

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We report results on molecular hydrogen formation on surfaces of realistic analogues of dust grains under astrophysically relevant conditions. Experiments were conducted using two low energy hydrogen and deuterium beams impinging on samples kept at 6 to 20 K in an ultra-high vacuum chamber. Most of the results reported here are for molecular hydrogen formation on olivine (a silicate), but preliminary results on amorphous carbon and other materials will be presented as well.

Our main results are:

a) Recombination kinetics depends quadratically on reactants concentration at low coverage;

b) Mobility is dominated by thermally activated processes;

b) Recombination depends strongly on surface temperature between 8 and 15 K, depending on sample material.

Based on these results, we propose a model consisting of a set of rate equations for the recombination of molecular hydrogen in different astrophysically environments.

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