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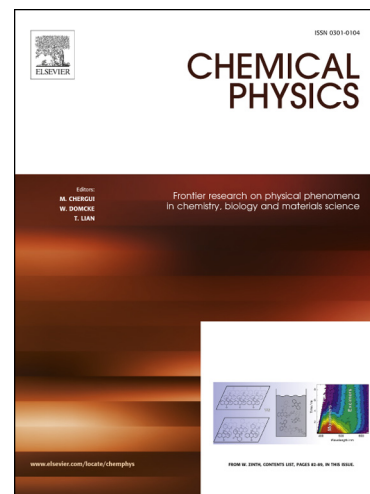
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Graphene and Graphite, Low Temperature Catalysts Producing Weakly-Excited Hydrogen Molecules

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Abstract

A model for the low-temperature catalysis of hydrogen molecules on graphene and graphite, relevant for interstellar chemistry, is proposed: hydrogen atoms are either chemisorbed at the edges, or physisorbed on graphene and transported to a chemisorbed state at the edges. A second atom can then produce a molecule via a hot atom or an Eley-Rideal process. Since much of the energy is needed to desorb the molecule from the tightly-bound chemisorbed state, the desorbing molecules have only low internal excitation energy, in agreement with astronomical observations.

The formation of hydrogen molecules from the recombination of H atoms in the interstellar medium is crucial to the formation of prestellar clouds. It is assumed that this occurs via catalytic processes on the surface of dust grains. A large portion of the dust grain composition in diffuse regions of the inter-
 5 stellar medium is thought to be of carbonaceous material. Many theoretical investigations have therefore been concentrated on graphene or graphite [1, 2]. Here, we do not consider dense clouds where the grains are probably covered by ice mantles but concentrate on diffuse clouds containing graphene and graphite

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