

Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Effects of Charged-Magnetic Grains in Protoplanetary Disks

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— The interaction and growth of dust grains is an important process in early planetesimal formation. The structure of aggregates formed from dust depends largely on the initial properties within the dust population, whether the grains are charged or uncharged, magnetic or non-magnetic. Theoretical simulations examining pairwise interactions between aggregates indicate that charged magnetic grains exhibit different growth behavior than populations consisting of exclusively charged or exclusively magnetic grains. This study extends that work to predict how charged-magnetic grains influence grain growth within an astrophysical environment. An N-body simulation containing various mixtures of dust materials is used to examine the differences in dust coagulation in the presence of charged magnetic aggregates. The growth of the dust aggregates is analyzed to determine the effects that charged magnetic grains contribute to the evolution of the dust cloud. Aggregate structure is also analyzed to determine how the morphology differs from aggregates built completely from ballistic collisions to determine how gas-coupling changes as aggregates grow to larger sizes.

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Date submitted: 12 Jul 2010

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