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Dipole-dipole interactions of charged magnetic grains ERIK REMKUS, JONATHAN PERRY, LORIN MATTHEWS, TRUELL HYDE, Baylor University — The interaction of charged dust grains is an important process in fields as diverse as planet formation and plasma processing of silicon wafers for computer chips. The interaction of the dust grains depends in part on the material properties of the initial dust population (conducting, non-conducting, ferrous or non-ferrous). The effects that electrostatic and magnetic forces have on the coagulation of dust in a protoplanetary disk are examined by modeling the interactions between extended dust aggregates – specifically looking at how the arrangement of charge over the aggregate surface or the inclusion of magnetic material produces dipole-dipole interactions which affect the orientation of grains as they collide and stick. Numerical models are used to simulate the charging and coagulation of dust aggregates formed from ferrous and non-ferrous materials. Analysis of the resulting dust populations demonstrate the effect of grain material on the structure of the aggregate, characterized by the fractal dimension. The aggregate structure not only governs the growth rate of aggregates, but also determines how well the grains couple to the gas in the protoplanetary disk. An improved understanding of the dynamics of aggregating dust grains and how these dynamics depend on grain materials will lead to greater knowledge of the early processes leading to planet formation.

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