

# Dusty Plasmas

Challenge	Existing Research Capabilities	Gaps	Opportunities	Relevance
Dust charging in astrophysical plasma and intense radiation environments	Ongoing lab experiments, theory and simulations	Limited studies of charging in intense radiation environments	Combined experiments (lab, near-earth, lunar, space) and theory	Dust in accretion disks; solar system formation
Growth and breakup of grains in astrophysical plasmas	Studies of growth in processing and fusion plasmas; some microgravity studies	Extensive lab studies, need for mapping to astrophysical systems	A dedicated space mission with a focus on charged dust	Planetesimal and star formation
Magnetized dusty plasmas	Some simulations, limited experiments	Need for sustained experimental and theoretical research	Studies of charging, instabilities, transport of magnetized dust and paramagnetic, ferromagnetic particles	Dust in interstellar medium; Basic studies of magnetic fields in space environment