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Complex Plasma with Multiple Distinct Particle Sizes BERNARD SMITH, TRUELL HYDE, MIKE COOK, JIMMY SCHMOKE, CASPER - Baylor University — Dust particle clouds can be found in most fusion and almost all plasma processing environments including both plasma-etching devices and in plasma deposition processes. Dust particles suspended within such plasmas acquire an electric charge from collisions with free electrons in the plasma. If the ratio of the inter-particle potential energy to the average kinetic energy is sufficient, the particles can form either a "liquid" structure with short range ordering or a crystalline structure with longer range ordering. The preponderance of experiments to date have employed monodisperse spheres to form the complex plasma system. In contrast, this paper examines the effect that a size distribution will have on overall particle ordering. Two dimensional (2D) plasma crystals were formed employing mixtures of 8.89 μm, 6.50 μm, and 4.57 μm monodisperse particles in Argon plasma. The pair correlation function was determined at differing pressures and powers and then compared to corresponding measurements obtained for monodisperse spheres alone and vibrational data was examined to determine specific dust and plasma parameters. Multiple experiments were conducted to investigate the manner in which system phase transitions and other thermodynamic properties depend upon the overall dust grain size distribution.

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