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A Gradient-Corrected, Analytic Screening Potential for Dense, Strongly-Coupled Plasmas[1] LIAM STANTON, Lawrence Livermore National Laboratory, MICHAEL MURILLO, Los Alamos National Laboratory, THE CIMARRON PROJECT COLLABORATION — We generalize the Yukawa potential to allow for moderate spatial variations in the electronic density and non-ideal contributions to the compressibility for both classical and quantum plasmas. Based on a gradient expansion around the Thomas-Fermi limit of density functional theory, the new potential contains a bifurcation that separates purely repulsive behavior from oscillatory, Friedel-like behavior. This potential has no empirical parameters and is valid at arbitrary temperature and density, yet it adds no additional computational complexity. We use this gradient-corrected screening potential to predict properties of warm dense matter that can be validated through XRTS experiments.

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