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Structure at the bottom of an accreted neutron star crust, and at the top of a magnetized crust TYLER ENGSTROM, NOAH YODER, VINCENT CRESPI, BENJAMIN OWEN, JAMES BRANNICK, XIAOZHE HU, Penn State — Neutron star crusts play a role in a growing list of observable phenomena. These include cooling and thermal structure of the star, gravitational wave emission, and quasi-periodic oscillations in the tails of magnetar flares. Below neutron drip density 4×10^{11} g/cc, an accreted crust contains a variety of nuclear species embedded in a relativistic, degenerate electron gas. We model interactions with Yukawa pair potentials, and carry out extensive structure searches using a genetic algorithm. The search results are used to calculate equilibrium phase diagrams for representative ternary systems. Pulsars are magnetic neutron stars with surface fields $\sim 10^{12}$ gauss. The outermost several meters of pulsar crust is a good candidate for description with the magnetic Thomas-Fermi model. We introduce a novel domain decomposition method for solving the nonlinear, periodized version of this model, and calculate the single-component phase diagram, equation of state, and other properties. Connections to astrophysical observables will be discussed.

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