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Neutron star crust microscopic simulations with realistic models

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We perform microscopic Molecular Dynamics simulations to study crystallization in the outer crust of Neutron Stars (NSs). We study the energetics and pressure in the electron screened nuclear system using a consistent nuclear population in the inner and outer crust under the approximation of one the component plasma (OCP) and multicomponent plasma (MCP) assuming some nuclear species contamination. We include Ewald summation techniques to allow a more efficient energy calculation. We go beyond previous point-like attempts by using a finite width gaussian ion charge distribution and finite temperature. We discuss how these results indicate that a less bound nuclear crust arises in this more realistic picture with respect to previous studies and how this may impact current and future prospects in gravitational wave sensitivity to NS observables.

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