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Time-dependent Hartree-Fock approach to nuclear pasta at finite temperature

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We present simulations of neutron-rich matter at subnuclear densities, like supernova matter, with the time-dependent Hartree-Fock approximation at temperatures of several MeV. This matter evolves into spherical rod-like and slab-like shapes and mixtures thereof.
The simulations employ a full Skyrme interaction in a periodic three-dimensional grid. With an improved Minkowski analysis, all eight pasta shapes can be uniquely identified by the sign of only two values, namely the Euler characteristic and the integral mean curvature.
The initial state consists of alpha particles randomly distributed in space and with a Maxwell-Boltzmann distribution in momentum space. Adding a neutron background initialized with Fermi-distributed plane waves the calculations reflect a reasonable approximation of astrophysical matter.

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