Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

A survey of nuclear pasta characterization using alpha shapes DIANA CARRASCO-ROJAS, University of Texas at El Paso, DMITRIY MOROZOV, Lawrence Berkeley National Laboratory, JORGE LOPEZ, University of Texas at El Paso — Nuclear pastas are speculated to be the densest material found on the universe, approximately 10 billion times stronger than steel. These can be found in the core of a neutron star, which are resultant from the death of a massive star. Up to date, there is no good way to characterize nuclear pastas; furthermore, knowing the type of pasta formed in the crust of a neutron star is an important factor when understanding starquakes, pulsar frequencies and neutron star evolution. This research project explored the possibility of using alpha shapes to characterize nuclear pastas between their different types. Molecular dynamic simulations, where only neutrons and protons were considered, and not the electron gas interaction, were the base of this study. The initial conditions chosen were temperature of 4MeV and 4000 nucleons (2000 protons and 2000 neutrons). As it is known that pastas can exist at low temperatures and sub-saturation densities, simulations were made for all possible combinations of final temperature from 0.01 to 1 MeV and densities from 0.02 to 0.2 fmˆ3. Pastas were found to exist around densities of 0.02 and 0.08 fmˆ3 in temperatures from 0.01 to 1 MeV. Moreover, the types spaghetti, lasagna, and gnocchi were able to be characterized.

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Date submitted: 11 Jan 2022 Electronic form version 1.4