Abstract Submitted
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Molecular dynamics simulations of the crust of accreting neutron stars CHARLES HOROWITZ, Indiana University — We model the crust of accreting neutron stars with molecular dynamics simulations involving complex compositions with many different impurities as predicted by Gupta el al. electron capture calculations. We present results for the phase structure [1], thermal conductivity, and screening factors for nuclear reactions [2]. We find a lattice structure with a high thermal conductivity, instead of an amorphous solid, and we discuss the distribution of impurities. These thermal conductivity results agree with X-Ray observations of crust cooling for neutron stars after extended outbursts. We find that screening factors for the enhancement of thermonuclear reactions may be insensitive to the large scale distribution of impurities in the solid. Fusion of neutron rich oxygen isotopes such as ^{24}O + ^{24}O may be an important heat source at densities near ten to the eleventh g/cm^3. Indeed these and similar fusion reactions may be important to heat the crust to carbon ignition temperatures in superbursts. [1] C. J. Horowitz, D. K. Berry, and E. F. Brown, PRE75 (2007) 066101. [2] C. J. Horowitz, H. Dussan, and D. K. Berry, arXiv:0710.5714.

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