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Neutron stars meet constraints from astrophysics, gravitation, high and low energy nuclear physics

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We apply the novel equation of state, which includes the surface tension contribution induced by the interparticle interaction and the asymmetry between neutrons and protons, to the study of neutron star properties. This equation of state is obtained from the virial expansion for the multicomponent particle mixtures that takes into account the hard-core repulsion between them. The considered model is in full concordance with all the known properties of normal nuclear matter, provides a high quality description of the proton flow constraints, hadron multiplicities created during the nuclear-nuclear collision experiments and equally is consistent with astrophysical data coming from neutron star observations and GW170817 merger. The found mass-radius relation for neutron stars computed with this equation of state is consistent with astrophysical observations. This talk will show how the induced surface tension (IST) equation of state opens an elegant way to describe the properties of matter across a very wide range of densities and temperatures.

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