The Influence of Strong Magnetic Fields on the Structure and Composition of Neutron Star Crusts

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At the end point of stellar evolution, strongly magnetised neutron stars – magnetars, are not only among the most compact stars in the universe, but also the strongest magnets. These conditions can significantly alter the properties of the outermost regions of a neutron star. We have recently studied the influence of a very strong magnetic field on the equilibrium properties of magnetar crusts when taking into account the Landau-Rabi quantization of electron motion. Both the outer and inner regions of the crust are treated consistently within the framework of the nuclear-energy density functional theory, thus allowing us to calculate their composition and their equation of state in a unified way. Our study covers a wide range of magnetic-field strengths necessary for modelling astrophysical phenomena. Results using accurately calibrated Brussels-Montreal nuclear energy density functionals, which were constructed from generalized Skyrme effective nucleon-nucleon interactions, will be presented.