Relativistic Hartree-Bogoliubov Description of the Neutron Drip-Line in Light Nuclei

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The Relativistic Hartree Bogoliubov theory is applied to the description of properties of light nuclei with large neutron excess. Pairing correlations and the coupling to particle continuum states are described by finite range two-body forces. Using standard parameter sets for the mean-field Lagrangian and the pairing interaction of Gogny, self-consistent solutions in coordinate space are calculated for the ground states of a number of neutron-rich nuclei. The model predicts the location of the neutron drip-line, a reduction of the spin-orbit interaction, *rms* radii, changes in surface properties, and the formation of neutron skins and of neutron halos.

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Relativistic Hartree-Bogoliubov description of ground-state properties of Ni and Sn isotopes

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The Relativistic Hartree Bogoliubov (RHB) theory is applied in the description of ground-state properties of Ni and Sn isotopes. The NL3 parameter set is used for the effective mean-field Lagrangian, and pairing correlations are described by the pairing part of the finite range Gogny interaction D1S. Fully self-consistent RHB solutions are calculated for the Ni ($28 \leq N \leq 50$) and Sn ($50 \leq N \leq 82$) isotopes. Binding energies, neutron separation energies, and proton and neutron *rms* radii are compared with experimental data. The model predicts a reduction of the spin-orbit potential with the increase of the number of neutrons. The resulting energy splittings between spin-orbit partners are discussed, as well as pairing properties calculated with the finite range effective interaction in the *pp* channel.

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Relativistic Hartree-Bogoliubov Description of the Lithium Isotopes

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Here we report the development of the relativistic Hartee-Bogoliubov theory in coordinate space. Pairing correlations are taken into account by both density dependent force of zero range and finite range Gogny forces. As a primary application the relativistic HB theory is used to describe the chain of Lithium isotopes reaching from ^{6}Li to ^{11}Li. In contrast to earlier investigations within a relativistic mean field theory and a density dependent Hartree Fock theory, where the halo in ^{11}Li could only be reproduced by an artificial shift of the $1p_{1/2}$ level close to the continuum limit, the halo is now reproduced in a self-consistent way without further modifications using the scattering of Cooper pairs to the $2s_{1/2}$ level in the continuum. Excellent agreement with the recent experimental data is observed.

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