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In-source Laser Photoionization Spectroscopy of 191-218Po Isotopes at ISOLDE

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Shape coexistence at low excitation energy in nuclei is a phenomenon for which interest has been continuously growing on both the experimental and theoretical fronts. The region around the neutron mid-shell N = 104 and closed proton shell Z = 82 is especially prolific. The platinum isotope (Z = 78) ground states show a transition from the weakly deformed oblate shape at A < 176 and A > 188 to a strongly prolate configuration for 176 < A < 188 with shape coexistence in the mass region of the transition between the two groups of deformation. Similarly the mercury isotopes (Z = 80) around N = 104 show shape coexistence and shape transition and, for the lightest isotopes (N<106), a large odd-even staggering in the charge radii as well as a large shift between the ground state and the isomer charge radii. More recently, the mean squared charge radii of the neutron-deficient 182–190Pb isotopes have been studied at ISOLDE under experiment IS407 using the in-source laser photoionization spectroscopy.

The polonium isotopes (Z = 84) are required to understand the transition across the proton shell closure of Z = 82. Although extensive studies have been performed on the neutron-deficient isotopes the measurement of the charge radii was limited to the longest lived isotopes 200,202,204–210Po . The recent α-, β- and γ-spectroscopy studies on neutron-deficient polonium isotopes down to A = 190 have highlighted ground state shape coexistence. Those observations should be reflected on the charge radii similarly as in the case of mercury.

Charge radii and electromagnetic moments of the Po isotopes (191, 192, 193, 193m, 194, 195, 195m, 196, 197, 197m, 198, 199, 199m, 200, 201, 201m, 202, 203, 204, 206, 207, 208, 209, 210, 211, 216, 218) have been measured at ISOLDE by simultaneous atomic- and nuclear-spectroscopy (in-source laser photoionization spectroscopy) in a framework of IS 456. According to the preliminary analysis of the experimental data the evolution of the even-A isotopes shows a departure from the trend beyond A = 198.

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