Trends and perspectives in ion mobility measurements and computations

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[2]GSI – Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany Gas-phase ion mobility is a transport property that is strongly sensitive to the ion's electronic structure. Thus, ion-mobility measurements allow not only to distinguish different ions, but even to characterize the same ions in different electronic states. This feature has been exploited to develop novel experimental techniques, that target the characterization of heavy and superheavy elements with accuracies far higher compared to standard photoelectron spectroscopy techniques. The interpretation of such measurements and the predictions of trends in the mobilities of ions belonging to the same period or group of the Periodic Table rely on a close interplay with accurate ab initio computations. In this presentation, the principles governing the mobility of ions in buffer gases is summarized, with a particular focus on the computational and experimental state of the art, alongside the future perspectives offered by Ion-Mobility Spectroscopy and Laser Resonance Chromatography.