HFML-FELIX and Lead-free Halide Double Perovskites

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HFML-FELIX is a new Dutch national research institute as a partnership between the institutes organization of the Dutch Research Council (NWO-I), Radboud University, Radboud University Medical Center and six other Dutch universities (Delft University of Technology, University of Maastricht, University of Twente, University of Amsterdam, Leiden University and the University of Groningen). It is located on the campus of Radboud University, in Nijmegen, the Netherlands. In the first part of the talk I will describe the mission of HFML-FELIX to perform ground-breaking research by enabling molecules and materials to be taken to the extremes of modern-day technology both in terms of (persistent) magnetic field strength and intense radiation in the infrared/terahertz range of the electromagnetic spectrum. I will give an overview of the experimental infrastructure, which serves as an open-access facility for the (inter)national scientific community offering unique conditions for research at a large number of dedicated user stations for a broad spectrum of research fields, including physics, chemistry, astronomy and biology.

In the second part of the talk I will discuss the properties of some lead-free halide double perovskite semiconductors, which have emerged as a promising class of stable, non-toxic optoelectronic materials with potential applications in photovoltaics, lighting and spintronic technology. They have a common chemical formula $A_2MM'X_6$ with *A* a monovalent cation, *M* and *M'* monovalent and trivalent metal ions, respectively, and *X* a halide ion. These materials possess a soft polar lattice with strong electron-phonon coupling. I will describe the optical properties of $Cs_2AgInCl_6$ single crystals, which favors the formation of self-trapped excitons, leading to broad photoluminescence spectra and the magnetic properties of $Cs_2Ag_{1-x}Na_xFeCl_6$, which show anti-ferromagnetic ordering at low temperatures.