H2020 MSCA - ITN - 2017 - 766007

Magnetics and Microhydrodynamics, from guided transport to delivery

ESR 7 Structure and magnetism of concentrated ionic solutions

Research project	Diffusion in liquids is usually treated in the dilute limit in terms of uncorrelated random thermal motion of dissolved ions, directed by a concentration gradient The concentration limit, where motions of ions are highly-correlated, is much more interesting, and the distinction between diffusion and advection is blurred appears that ions in concentrated solutions move in highly-correlated groups o 10^5-10^5 [1].The response of concentrated aqueous solutions of paramagnetic ions to a magnetic field gradient will provide important insight into these correlations; a drop of paramagnetic solution in water can be easily manipulat by a magnet, although the magnetic field gradient forces on single isolated ions are orders of magnitude less than the entropic force driving their diffusion. The dynamic structure and correlations in ionic solutions, and the resulting magnetophoresis will be investigated by studies of 3*d* and 4*f* ions, coupled with synchrotron studies of dynamic structural correlation, and small-angle neutron scattering (LLB), complemented by molecular dynamics simulations (MPG). Results will be i) a proof of concept of magnetic separation of rare earth ions solution using magnetic field gradients and ii) design of novel magnetic antitub [2], filaments of pure water confined by a surrounding paramagnetic solution i nonuniform magnetic field. [1] O.Y. Gorobets, Y.I. Gorobets and V.P. Rospotniuk, *J. Appl. Phys.*, **118** (2015), 73902. [2] J.M.D. Coey et al., *Proc. Natl. Acad. Sci.*, **106** (2009), 8811.
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Host Institution	Trinity College Dublin School of Physics, Magnetism and Spin Electronics Group Trinity College, Dublin 2, Ireland. https://www.tcd.ie/Physics/
Required profile	The candidate should hold a good honours or master's degree in Physics or Chemistry, with a strong background in magnetism, condensed matter, or physical chemistry. They should have a passion for interdisciplinary research. Stays are planned at the Institut Leon Brillouin (LLP Paris) and the Max-Planck Institute (MPI Gottingen), as well as advanced IP training The candidate should not have lived in Ireland in the past 12 months.