

HIGHLANDS IN CHEMISTRY SEMINAR SERIES



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UNIVERSITY OF OSLO

“The Exotic Chemistry in a Strong Magnetic Field”

In ultrastrong magnetic fields, of the order of 100 kT, the magnetic forces acting on the electrons in atoms and molecules are as strong as the Coulomb forces, affecting chemistry in dramatic ways. Under the influence of the magnetic field, molecules are squeezed and twisted out of their familiar shapes. Covalent bonding is replaced by paramagnetic bonding, generated by stabilization of antibonding orbitals by magnetic currents induced by the magnetic field. Paramagnetic bonding give rise to flakes of helium atoms and other molecules not observed on Earth, but potentially present in the atmospheres for magnetic white dwarfs. Rovibrational spectra are strongly affected, reflecting hindered rotation and pendular vibration in the field, with splittings and overtones dramatically different from those on Earth.

The exotic chemistry of atoms and molecules in strong magnetic fields provides a fresh perspective on the familiar chemistry on Earth — at the same time, it provides a stress test for quantum chemistry, whose methods have been developed for Earth-like conditions. In the talk, we give an overview of molecular electronic structure in ultrastrong magnetic fields, discussing atomic and molecular structure, chemical bonding, atomic and molecular stability, molecular rovibrational spectra and dynamics.

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2:30PM ET

ZOOM

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