

Magnetic materials based on sandwich lanthanide complexes with phthalocyanines

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Sandwich lanthanide phthalocyaninates are very promising molecular materials with unique physico-chemical properties, including magnetic ones. Different types of such materials were developed recently in our group and obtained results will be discussed in the report.

Thus, the introduction of crown ethers into homoleptic Tb(III) and Dy(III) trisphthalocyanates allows their solubilisation in aqueous medium and application as NMR thermosensors in physiological temperature range (303-323 K) due to high temperature sensitivity of lanthanide induced shifts, achieving values of $\frac{\delta T}{T}$ up to 1.1 and 0.55 ppm/K respectively [1-3].

Heteroleptic trisphthalocyaninates bearing two adjacent crown-substituted ligands act as receptors which can bind potassium cations. This process results in switching of the coordination polyhedron of the corresponding lanthanide cation from square-antiprismatic to square-prismatic. In turn it results in spectacular increase in the axial component of the magnetic susceptibility tensor providing new tool of supramolecular control of magnetic properties of lanthanide complexes [4]. Octopus-like Tb(III) bisphthalocyaninate bearing eight thioacetate-terminated tentacles in one ligand and crown-ether rings in another ligand can form self-assembled monolayers on gold surface. Face-on orientation allows for subsequent binding of crown-phthalocyanines via potassium ion bridges, providing a heterogeneous bilayer with expanded redox-behaviour, where distinct redox-states can be read out using optical density measurements [5]. The proposed approach can be used in wide range of switchable materials, including single-molecule magnets, conductive, and optical devices, etc.

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