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Start Time: Friday, June 24, 2022 02:00 pm

End Time: Friday, June 24, 2022 04:00 pm

Employing Radicals and Bismuth in Lanthanide Single-Molecule Magnet

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Molecules that possess an energy barrier to spin inversion have intriguing potential applications in areas such as magnetic refrigeration, molecular spintronics and high-density information storage. For these applications, however, key performance characteristics such as large spin-relaxation barriers (U_{eff}) and high magnetic blocking temperatures (T_B) are required. Lanthanides have been proven to be particularly well-suited for the design of single-molecule magnets owing to their large magnetic moments and magnetic anisotropy that stem from strong spin-orbit coupling of the 4f orbitals. By using lanthanide ions such as Tb^{3+}, Dy^{3+}, and Er^{3+} which possess intrinsically large orbital angular momentum, significantly higher U_{eff} and T_B can be achieved. A general methodology to improve T_B in multinuclear single-molecule magnets is to generate strong magnetic exchange between lanthanide centers through the employment of radical bridging ligands with diffuse spin orbitals that can penetrate the core electron density of the lanthanide ions where the 4f spin orbitals lie buried. Another successful approach to strong coupling targets the use of heavy p-block elements since their diffuse valence orbitals facilitate better penetration of the core electron density of the lanthanide ions relative to diamagnetic ligands comprising lighter p-block elements. Here, we will present the synthesis of multiple lanthanide single-molecule magnets that contain radical ligands and bismuth clusters, respectively [1-3]. The latter class of compounds were synthesized through a solution organometallic approach and represent the first single-molecule magnets containing bismuth donors which lead to new prospects in synthetic chemistry and physics, Figure 1

[1] Delano IV, F.; Castellanos, E.; McCracken, J.; Demir, S. *Chem. Sci.* **2021**, *12*, 15219.

[2] Benner, F.; Demir, *Chem. Sci.* **2022**, *13*, 5818.

[3] Zhang, P.; Benner, F.; Chilton, N. F.; Demir, S. *Chem* **2022**, *8*, 717.

Prof. Dr. Matthias Drieß

Organizer