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Physical properties of a new magnetic liquid crystal based on Co(II) ions.

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Our aim was to obtain a new Co(II) –based material that would show both liquid crystalline properties and slow magnetic relaxations. The compound was obtained in a reaction of 4, 4'-dinonyl –2, 2'-bipyridine (4D2B) with CoCl_2 . The choice of the ligand was determined by the fact that cobalt salts with pyridine alone form Single Ion Magnets, which is proven by other research done in our group, and the likelihood of LC properties to be induced by the long chains attached to the bipirydine. Differential Scanning Calorimetry was used to check for multiple phase transitions. The DSC curves for the ligand and the compound are different, so the reaction has certainly altered the properties of the material. Polarizing microscopy and X-Ray Diffraction were also used to characterize this new compound. Magnetic measurements proved that it is a spin glass and does indeed exhibit slow magnetic relaxations with $\tau_0 = 340.41$ s and $\Delta/k_B = 0.78$ K. However different these relaxations may be from the ones shown by Single Ion Magnets, we think that our research opens a new chapter, which will connect magnetism and the science of liquid crystals. This path is very interesting; such multifunctional materials can have many applications, and will join two fields of material research. In the future, we want to use other ligands.

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Primary author: Mr LALIK, Sebastian (Institute of Physics, Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland)

Co-authors: DEPTUCH, Aleksandra (Institute of Physics, Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland); Dr MAJCHER, Anna (Institute of Physics, Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland); Mr FITAS, Jakub (Institute of Physics, Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland); Dr MARZEC, Monika (Institute of Physics, Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland); Dr STEFAŃCZYK, Olaf (Department of Chemistry, School of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan); Dr JAWORSKA - GOŁĄB, Teresa (Institute of Physics, Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland)

Presenter: Mr LALIK, Sebastian (Institute of Physics, Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland)

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