

THIN FILMS OF DISCRETE MOLECULES

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Access to the first organic spin valves was reported more than a decade ago and motivated the development of further novel devices as, *for example*, spin-OFETs (Organic Field Effect Transistors).^[1] Nowadays, molecules integrated into spintronic devices ranges from diamagnetic molecules to individual single molecule magnets (SMMs).^[1] Among them, (metallo)porphyrins or -phthalocyanines are, due to their chemical and thermal stability and the possibility to tune their properties on demand, very promising in terms of application.^[1] Hence, selected examples of thin film deposition using porphyrins of the type **H₂THPP** (tetra(p-hydroxyphenyl)porphyrin)^[2a,b] and **MTMPP/H₂TMPP** (tetra-(4-methoxyphenyl)porphyrin, M = Cu^[2c], Cu,^[2d] Ni^[2d]) are reported. Their electronic structure, local transport characteristics and their magneto-optical (MO) properties will be presented. In addition, results obtained for two series of porphyrins of the type **MTPP(CON(R₂)₄)** (series I/II, cf. Fig. 1) will be presented. Furthermore, novel 2D polymers obtained of **CuTPPBr₈** on Au(111) (TPP = 5,10,15,20-tetraphenylporphyrin,) will be shown.^[3]

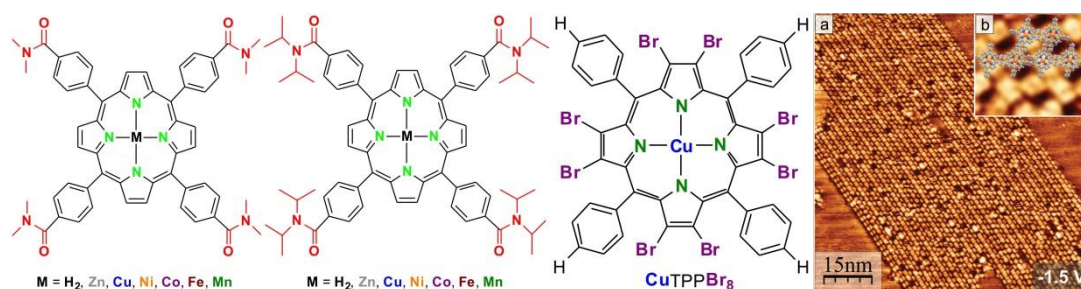


Fig. 1. Chemical structures of MTPP(CON(R₂)₄) porphyrins of series I (left) and II (middle) and of **CuTPPBr₈** (right). STM image of an 2D polymer formed of **CuTPPBr₈** on Au(111) (right).^[3]

An alternative approach to fabricate thin films is given in principle by the spin-coating method, a well-established and cost-effective method for diverse applications.^[4] However, the formation of smooth thin films of discrete molecules remains challenging.^[4] Based on trinuclear bis(oxamato) type complexes a strategy will be presented to overcome this obstacle.^[4]

Keywords: (metallo)porphyrins, (metallo)phthalocyanines, trinuclear complexes, molecular and crystal structure, dispersion interactions, spin-coating.

References

- [1] T. Birnbaum, T. Hahn, C. Martin, J. Kortus, M. Fronk, F. Lungwitz, D.R.T. Zahn, G. Salvan, *J.Phys.: Condens. Matter* 26, **2014**, 104201 and references cited therein.
- [2] ^aL. Smykalla, P. Shukryna, C. Mende, T. Ruffer, H. Lang, M. Hietschold, *Surface Science* 628, **2014**, 92. ^b*ibid*: 628, **2014**, 132. ^cP.F. Siles, C.C.B. Bufon, D. Grimm, A.R. Jalil, C. Mende, F. Lungwitz, G. Salvan, D.R.T. Zahn, H. Lang, O. Schmidt, *Organic Electronics* 15, **2014**, 1432. ^dF. Lungwitz, C. Mende, M. Fronk, F. Haidu, H. Lang, G. Salvan, D.R.T. Zahn, *Thin Solid Films* 571, **2014**, 377.
- [3] L. Smykalla, P. Shukryna, M. Korb, H. Lang, M. Hietschold, *Nanoscale* 7, **2015**, 4234.
- [4] M.A. Abdulmalic, M. Fronk, B. Bräuer, D.R.T. Zahn, G. Salvan, F.E. Meva, T. Ruffer, *J. Magn. Mater.*, (**2016**), *in print*, <http://dx.doi.org/10.1016/j.jmmm.2016.06.002> and references cited therein.