(MAGNETO-)OPTICAL PROPERTIES OF MAGNETIC MOLECULAR LAYERS

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In this contribution we will provide an overview on investigations of the magneto-optical response of thin films of phthalocyanine molecules on substrates which are relevant for (spin) organic field effect transistors (SiO_2) or vertical spin valves (Co) in order to explore the possibility of implementing phthalocyanines in magneto-electronic devices, the functionality of which includes optical reading.

The optical and magneto-optical properties of phthalocyanine thin films prepared by organic molecular beam depositio [1,2,3] or by spin coating [4] on silicon substrates were investigated by variable angle spectroscopic ellipsometry (VASE) and magneto-optical Kerr effect (MOKE) spectroscopy at room temperature. The magneto-optical activity of phthalocyanine molecules in the UV-vis spectral range is determined by the highest occupied and lowest unoccupied molecular orbitals and their hybridization degree with the central metal ion. In addition to the details of the molecular electronic structure, the growth mode and hence the molecular orientation with respect to the substrate can dramatically tune the magneto-optical activity. In the case of phthalocyanine films, the tuning of the molecular orientation can be achieved by controlling the substrate surface properties via the substrate treatment [1] or via exploiting a templating effect introduced by ultra-thin molecular layers or by using metallic ferromagnetic substrates (Co).

Our observations open new perspectives for combining magnetism and optics in devices such as spin-OFETs and organic spin valves. The change in polarization state of a linearly polarized light beam reflected by an active layer of $TbPc_2$ might be used as a diagnosis tool for eventual electronic changes under applied electric/magnetic field in a spintronic device.

Keywords: phthalocyanines; porphyrins; magneto-optical response

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