Magneto-Optical Effect in Suspensions of Anisometric Pigment Particles

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Introduction

Colloidal suspensions of anisometric particles show a complex behaviour in electric field and have a great potential for development of smart functional materials [1]. It has been shown that binary mixtures of dichroic pigment suspensions with ferrofluids show enhanced magneto-optic effect. Characterisation of this effect was the main aim of this investigation.

Experimental

We measured field-induced dichroism and birefringence using a photoelastic modulator. Split Helix magnet was used.

Results and Discussion

Pure suspension of pigment particles showed a diamagnetic response in high magnetic field. Bitrefringence was increasing continuously in the range from 5 - 25 T. The mixtures of the pigments with a small amount (<0.8 v%) of a ferrofluid considerably enhanced the optical response. The reorientation occurred in the range of 1 mT - 1 T. Using dichroism measurements, we showed that the particles align along the **B** field at low field strength and perpendicular to the field at high field strengths. At low fields, the sterically-induced interaction transfers the orientation of magnetic particles to the non-magnetic phase. At higher field, the diamagnetic properties of the pigment particles dominate [2].

Conclusions

We measured diamagnetic response in pure suspensions and strongly enhanced magneto-optical effect. We demonstrated a novel type of multifunctional electro- and magneto-responsive colloidal material.

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References

[1] Eremin. A., *et al*., Adv. Funct. Mater., **21**, 556-564 (2011).
[2] Eremin. A., *et al*., Langmuir, in preparation

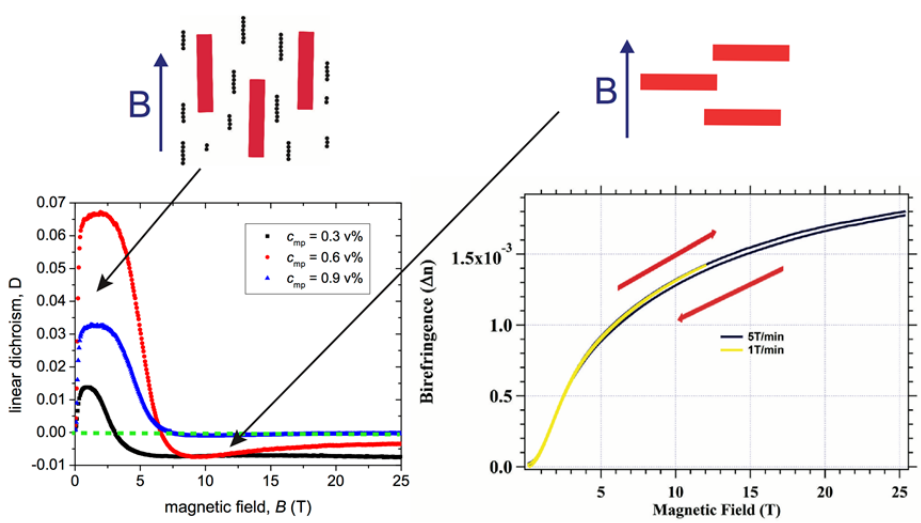

Fig.1 (a) Field dependence of linear dichroism in a mixture of the pigment suspension with a ferrofluid; (b) field-induced birefringence in a pure suspension of pigment particles.