

Nano- and Microstructured Optical Coatings by Phase Separation in Sol-Gel Solutions

Martin Timusk, Martin Järvekülg, Triin Kangur

University of Tartu, Institute of Physics, Riia 142, Tartu, Estonia
martin.timusk@ut.ee

Abstract

We present our results in nano- and microstructural design of oxide materials by synthesis strategies based on phase separation in sol-gel system. Condensation of hydrolyzed silicon or metal alkoxides progressively decreases the solubility between the gel-forming component and a polar solvent, leading to the formation of spatially separated phase domains. This mechanism has been used for preparing oxide films with continuous pore network [1]. We have applied similar approach to develop high-performance electro- optical hybrids in which LC droplets are encapsulated in gel matrix (Figure 1) [2]. Possible applications include privacy glass, optical sensors, light modulators and angular discriminating filters. We have also used the same phase separation principles in a novel method for patterning substrates with round silica features with diameters tunable from nano to micro scale (Figure 2) [3]. In addition to non-wetting properties of such surfaces, optical functionality is also achieved as each surface feature acts as a lens. These patterned surfaces can thus be used as structured diffusive, light trapping or anti-glare coatings.

References

- [1] Nakanishi K., Tanaka N., Accounts of Chemical Research **40** (2007) 863
- [2] Timusk M., Järvekülg M., Salundi A., Lõhmus R., Kink I., Saal K., J. Mater. Res. **27** (2012) 1257
- [3] Kangur T., Nurmis, L., Järvekülg M., IOP Conf. Ser.: Mater. Sci. Eng, **in print** (2013)

Figures

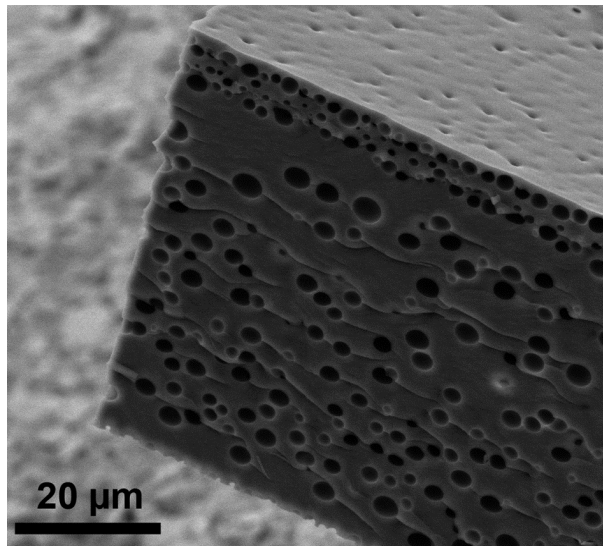


Figure 1. Structure of silica gel-LC hybrid

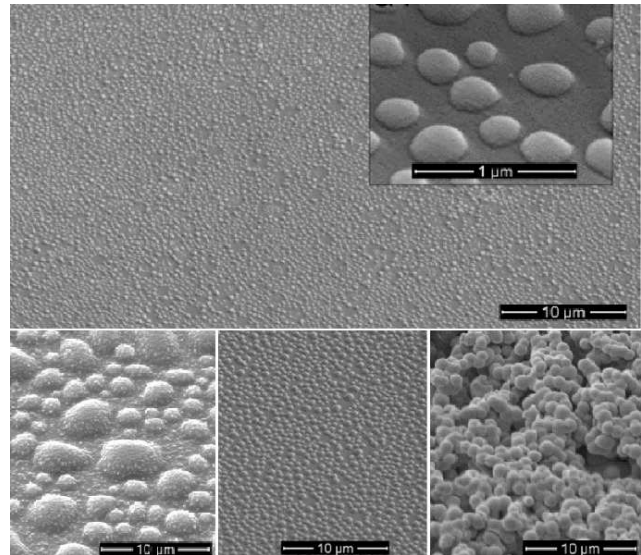


Figure 2. Nano- and microstructured coatings