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ECIS 2023

37th European Colloid and Interface Society Conference

3rd – 8th September 2023

Naples – Italy

Book of Abstracts

Micrometric structuration displaying correlated disorder to tune visual appearance in thin film

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We report the fabrication and optical properties of 2D nanostructured layers with differing degrees of structural correlation. Novel optical functionalities result by controlling the spatial arrangement of optical scatters. Disordered structures are currently being explored to generate new visual effects, such as angle-dependent diffusion.[1] Correlated disorder may provide new appearence[1], and can be tuned using bottom-up chemistry.[2] In our case, we explore correlated structures using perforated dielectric surfaces, synthesized by dip-coating (Figure 1). The perforations are formed by water adsorption into the film from a humid environment, driven by the salinity of the film. The macroperforation density and diameter can be reliably varied by adapting solution chemistry (e.g. salt concentration, surfactant/Si ratio) and sol-gel drying processes (relative humidity, drying temperature, solvent volatility)[3]. By carefully choosing the synthetic conditions, a surface displaying short-range structural correlation between perforations was achieved. Angle-dependent diffusion was observed as the intensity of diffused light was more intense at larger angles of observation, with a suppression of diffuse reflectance around the specular direction. The appearance of the surface is thus tunable. In the future, we will work to increase the optical index of the thin films fabricated.

Keywords: visual appearance, bottom-up chemistry, light diffusion and surfaces, thin film.

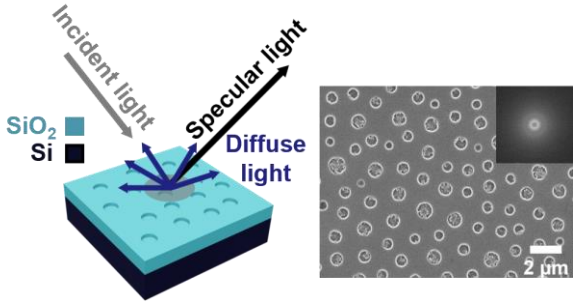

Figure1. *(left) Perforated silica layer formed via sol-gel synthesis. (middle) 3D surface with perforations as scatterers and (right) SEM image of the perforated surface and FFT of the surface.*

References

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