Nanoscale optical hydrophilic characterization

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Water vapor is generally present in environmental air during experiments development, unless explicit vacuum is required[1]. For surface science, water adsorption in hydrophilic samples is usually stressed, implying nanoscale experimental effects for scanning probe microscope techniques[2]. Scanning Near Field Optic microscope (SNOM), deals with the study of the dielectric properties of matter making use of near field optics[3]. Thus, the humidity presence causes relevant effects, especially when water condensation appears between tip and sample. We combine two simulation methods (FDTD for light propagation and a Lattice-Gas Monte Carlo simulations for water condensation) to study this effect on optical signals detected by a SNOM setup. The results obtained show how the water bridge formation plays an important role not only in the optical image, allowing for the achieving of a high contrast for hydrophilic patches Fig (1), but also in the tip-sample distance control[4]. This work contributes with new data retrieving the original application of SNOM, an instrument able to study the optical properties of matter overcoming the diffraction limit, and extending it to study the hydrophilic character of polymeric and biological samples.

References

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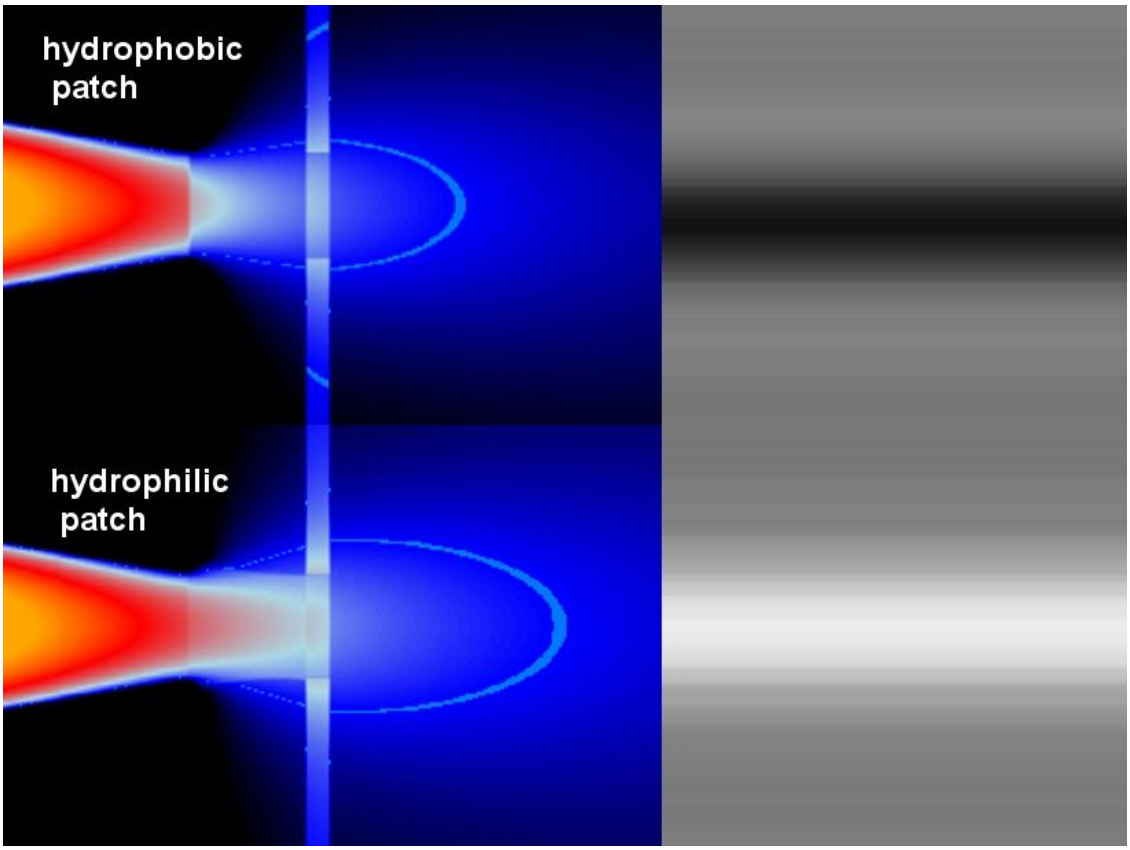

Figure 1. (Left) Intensity distribution of the SNOM transmitted signal using two different hydrophilic character samples. (Right) Contrast map of the two samples.