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Sol-gel based surface patterning

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Photolithography is a well-known and often used technique. However, this technique is mainly used for bulk material or native oxide etching and usually requires an etching step with a strong acid or base. Due to these reasons, photolithography is not well compatible with sensitive substrates like glass or plastic ones. Based on sol–gel route, we formulated and optimized different all-inorganic oxides photo-resists. These photo-resists lead to single-step lithography (i.e. with only one deposition step) of nanometer-scale thin oxides films, etched with solvent or diluted acid. Such method is compatible with the formation of gratings in the range of the millimeter to the sub-micrometric size on rather large surfaces on top of glass or plastic substrates. Our photoresists where made by integrating a photosensitive chelating compound to a "classical" sol-gel oxide sol. These photoresists may be deposited by spincoating on various substrates, then insolated through a mask and selectively washed/etched. On one hand, TiO2 photo-resist was investigated for the functionalization of surfaces with a spatial wettability contrast. On the other hand, ZnO photo-resist was studied for the localized growth of ZnO nanowires. The synthesis principle will be introduced at the conference. The physicochemical and morphological properties of the obtained surfaces, linked to the process parameters, will be presented. Moreover, potential applications will be shown.

Recent Publications

1. C Ternon, T Demes, F Morisot, D Riassetto, M Legallais, et al. (2017) Mechanisms involved in the hydrothermal growth of ultra-thin and high aspect ratio ZnO nanowires. App. Surf. Sci. 410(2017):423–431.
2. T Demes, C Ternon, D Riassetto, V Stambouli and M Langlet (2016) Comprehensive study of hydrothermally grown ZnO nanowires. J. Mater. Sci. 51(2016):10652.
3. C Holtzinger, B Niparte, S Wächter, G Berthomé, D Riassetto, et al. (2013) Superhydrophobic TiO2 coatings formed through a non-fluorinated wet chemistry route. Surf. Sci. 617(2013): 141.
4. C Holtzinger, B Niparte, G Berthomé, D Riassetto and M Langlet (2013) Morphology-wettability relations in artificially structured superhydrophilic TiO2-SiO2 composite films. J. Mater Sci. 48(8):3107.
5. S Briche, Z Tebby, D Riassetto, M Messaoud, E Gamet, et al. (2011) New insights in photo-patterned sol-gel derived TiO2 films. J. Mater. Sci. 46(2011):1474.

Biography

David Riassetto is an Associate professor of Material Science. He got a Master of Science Degree in Physics and Energy with Honors in 2005 at the University Joseph Fourier of Grenoble and a PhD at Grenoble Institute of Technology in 2009. Between 2009 and 2011 he was a Postdoctoral Researcher at the University of Utah. Since 2011, he is an Associate Professor at Grenoble Institute of Technology and doing his researches in the LMGP Laboratory (Laboratory of Materials and Physical Engineering) as a Member of the Thin Films, Nanomaterials and Nanostructures team, and more precisely of the Wet Chemistry & Surface Functionalization group. Currently, his research focuses on the surface functionalization at the nanometer scale, using wet-chemistry methods (e.g. sol-gel, photochemistry).

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