Polymers for surface nanopatterning: from block polymer self-assembly to colloidal lithography

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Biography

Christophe Sinturel is Professor of Chemistry at the University of Orléans. He received his Master degree in Organic Chemistry in 1994 and his Ph.D. in Polymer Science in 1998 from the University Blaise Pascal of Clermont-Ferrand (France). He spent one year at the University of Brighton (UK) in 1999 as Postdoctoral Research Associate before being appointed as an associate professor the same year at the University of Orléans (France). After completion of his HDR (Habilitation à Diriger les Recherches) in 2008 he got a full-professor position at the University of Orléans in 2010. In 2014-2015, he spent a year at the Polymer Group of the University of Minnesota (USA), hosting by Prof. Marc Hillmyer, as a Visiting Scholar (délégation CNRS). Christophe is currently conducting his research at the ICMN, a joint Research Institute of the Centre National de la Recherche Scientifique (CNRS) and the University of Orléans, where he served as deputy director and director between 2018 and 2023. His current research interests concern mainly polymer in thin films such as polymer blends, nanostructured polymers, polymer nanocomposites and block polymers.

Abstract

Polymers deposited on surfaces exhibit different properties from the bulk due to limited amount of matter and surface interactions. In this presentation, we will highlight this specific behavior by recent examples of our group. We will firstly examine the possibility to obtain non-native block-copolymer self-assembly resulting from a constrained location of chains and junctions.[1] To this aim, we will show how a simple linear triblock terpolymer, based on a very basic chemistry (poly(isoprene)-block-poly(styrene)-poly(2-vinylpiridine) ISP) was able to produce exciting morphology. This includes tetragonally-packed rectangular rods by using blends and alternating gyroid capable to be transformed into cylinders due to the confinement effects generated by the thin film configuration.[2,3] In a second approach, we will detail recent results based on colloidal approach where preformed polymeric nanoparticles[4] where deposited onto surfaces in order to produce periodic patterns of line. In this case, suitably functionalized low molar weight polymers were pre-assembled in solution into high aspect-ratio rod-like nanoparticles and deposited on surfaces using different deposition modes. We will show how the deposition process and the surface/nanoparticle interactions can greatly affect the nanostructuration.

References

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