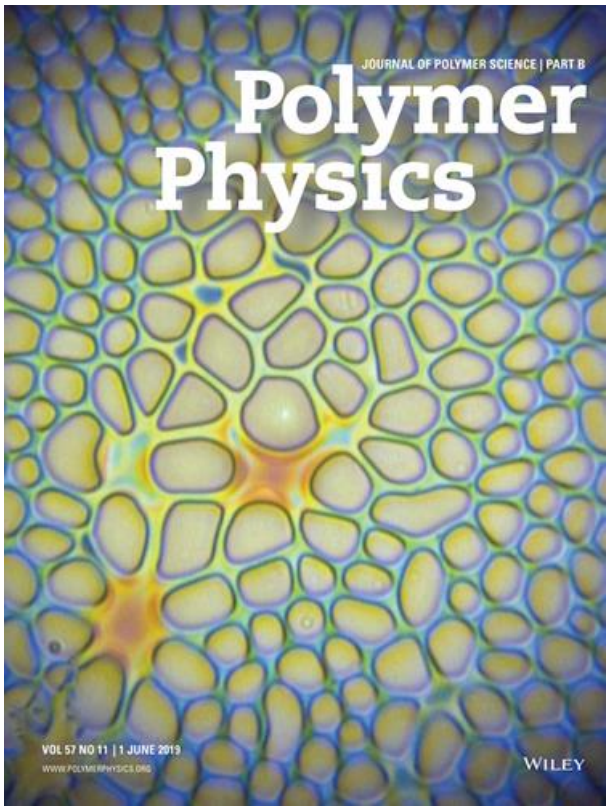
Press Release

Thin polymer films with reversible wettability



Researchers at the Theoretical and Physical Chemistry Institute, National Hellenic Research Foundation (NHRF), in Athens, Greece, developed thin films of polystyrene/poly(N-isopropylacrylamide) (PS/PNIPAM) polymer blends that show a reversible wetting behavior due to the thermoresponsivity of PNIPAM. PNIPAM in an aqueous solution undergoes a phase transition from a soluble to a considerably less soluble state at 32°C. Below 32°C, the PNIPAM chains are hydrophilic due to intermolecular H-bonding with water molecules. Above 32°C, the PNIPAM chains form a compact and collapsed conformation, which prohibits the interaction of the hydrophilic groups C=O and N–H with water. Because 32°C is close to the human body temperature, PNIPAM in hydrogel, solution, and nanoparticles is extensively investigated for biomedical applications, such as controllable drug release, tissue regeneration, cell-culture substrates, and filtration membranes, among others.

In this study, which is featured on the front cover of Volume 57, Issue 11, of the Journal of Polymer Science, Part B: Polymer Physics, spin-casted films of PS/PNIPAM

blends on silicon switch from hydrophilic to almost hydrophobic upon heating, a behaviour which is reversed when the films are cooled down to room temperature for several heating/cooling cycles. This is the first study on the thermoresponsive wetting behaviour of spin-casted films of PS/PNIPAM blends. Spin coating is a particularly promising method for thin-film growth for practical applications because it is simple and cost-effective. The results reported in this work pave the way for the development of smart surfaces by simple and controllable methods, suitable for numerous applications that require control of wettability over large areas, such as self-cleaning surfaces, industrial surface coatings, tissue engineering, cell encapsulation and immobilization, enzyme immobilization, sensing, and microfluidics, among others.

Article Reference:

"Thin films of PS/PS-*b*-PNIPAM and PS/PNIPAM polymer blends with tunable wettability"

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