Conferencia

INVERTED GRAFTING-TO PDMS BLOCK COPOLYMERS IN A PDMS MATRIX KEY TO SUPERIOR AQUEOUS LUBRICATION

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SALA DE GRADOS

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The ability to control lubrication is essential to avoid damage of the underlying material and to ensure low energy dissipation in biological and man-made mechanical systems. An Initial systematic approach to lower the surface friction of wet PDMS surfaces employed adhesion of various novel amphiphilic block or graft copolymers prepared by the controlled radical polymerization techniques, ATRP and RAFT (1-3). The systematic study concluded that only moderate lubrication of the PDMS surfaces could be achieved.

Here we like to advocate the novel concept: "inverted grafting-to" that forms hydrophilic polymer brushes by selective segregation of hydrophilic chains of amphiphilic diblock copolymers, PDMS-b-PEG or PMDS-b-PAA, from a PDMS matrix (4). The block copolymers are prepared by "click chemistry" or ATRP by use of the macroinitiator concept, respectively. Excellent grafting stability and restoring capabilities are achieved as revealed even under harsh tribologial testing since the hydrophilic polymer brushes are generated from an internal source of the material. The film can easily be applied to elastomers, metals and ceramic substrates by spin- or drip coating. The resulting sliding friction coefficients (□) are 0.001 to 0.05 for soft contacts depending on substrate, load, counter surface, pH, and salinity. Here the hydrophilic PAA shows much superior lubricity compared to PEG, which is rationalized by larger reduction of total free energy of the former upon hydration.

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