# Ultralow Friction with Hydrophilic Polymer Brushes in Water as Segregated from Silicone Matrix - DTU Orbit (08/11/2017)

**Ultralow Friction with Hydrophilic Polymer Brushes in Water as Segregated from Silicone Matrix**

Lubrication is essential to minimize damage to underlying material and ensure low energy dissipation in biological and man-made mechanical sys- tems. Surface grafting of hydrophilic polymer brushes is a powerful means to render materials that are slippery in aqueous environments. However, presently available approaches to graft polymer brushes on surfaces, e.g., “grafting-from” or “grafting-to” approaches, display several restrictions in terms of practical and long-term applications. Here a unique method of forming hydrophilic polymer brushes by selective segregation of hydrophilic chains of amphiphilic diblock copolymers, such as poly(dimethylsiloxane)- b - poly(ethylene glycol) (PDMS- b -PEG) and poly(dimethylsiloxane)- b -poly(acrylic acid) (PDMS- b -PAA) from the PDMS matrix with an “inverted grafting-to” approach, and its tribological applications, is presented. In this approach, as the hydrophilic polymer brushes are generated from an internal source of the material, excellent grafting stability and restoring capabilities are revealed even under harsh tribostress. The film can easily be applied to elastomers, metals, and ceramic substrates by spin- or drip-coating. Obtained sliding fric- tion coefficients ( μ ) are 0.001–0.05 for soft contacts depending on substrate, load, counter surface, pH, and salinity. Between the two types of hydrophilic polymer chains, PAA shows far superior lubricity compared to PEG, which is rationalized by the larger reduction of total free energy of the former upon hydration

## General information

State: Published
Organisations: Department of Mechanical Engineering, Materials and Surface Engineering, Department of Chemical and Biochemical Engineering, The Danish Polymer Centre, Technical University of Denmark
Authors: Røn, T. (Intern), Javakhishvili, I. (Intern), Hvilsted, S. (Intern), Jankova, K. (Ekstern), Lee, S. (Intern)
Number of pages: 11
Publication date: 2015
Main Research Area: Technical/natural sciences

## Publication information

Journal: Advanced Materials Interfaces
Article number: 1500472
ISSN (Print): 2196-7350
Ratings:

BFI (2017): BFI-level 1

Web of Science (2017): Indexed Yes

BFI (2016): BFI-level 1

Scopus rating (2016): CiteScore 3.57 SJR 1.451 SNIP 0.819

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 1

Scopus rating (2015): SJR 1.131 SNIP 0.63 CiteScore 2.47

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 1

BFI (2013): BFI-level 1
Original language: English
DOIs:

10.1002/admi.201500472
Source: PublicationPreSubmission
Source-ID: 118083262
Publication: Research - peer-review › Journal article – Annual report year: 2015