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Synthesis of diblock copolymer brush surfaces to control the adaptation time to water

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Young model describes the wetting behavior of an ideal surface. Recently, Butt et al., presented a model which connects adaptation processes of the surface to dynamic contact angles.[1] In the first phase of the SPP project, we developed an experimental setup which allows measuring adaptation processes. Li et al., used random copolymer surfaces to confirm the adaptation model.[2] Now, in the second phase of the SPP project, we want to synthesize polymer surfaces where we can control the adaptation time scale upon wetting and dewetting systematically. For this purpose, we use the Atom Transfer Radical Polymerization (ATRP) to selectively synthesize copolymer brushes consisting of a hydrophilic and hydrophobic block. In our synthesis we immobilized an ATRP initiator on a silicon wafer. Then we prepared PHEMA (Poly-2-hydroxyethyl methacrylate) as hydrophilic block from the initiated surface. In the next step we grafted Polystyrene or PEHMA (2-ethylhexyl methacrylate) as hydrophobic block from the first polymer block as a (macro)initiator. We realized grafted blockcopolymer brush films with a systematic variation of the molecular weights of PHEMA, PS and PEHMA. First results showed that with a layer of 13 nm PS brushes grafted from PHEMA (16 nm) the water contact angle (CA) is the same as on a pure PS surface (advancing contact angle=(93±2)°; RCA=(94±3)°).

References:
[1]: Butt, H.J.; Berger R. et al.; Adaptive Wetting-Adaptation in Wetting, Langmuir 2018, 34 (38), 11292-11304
[2]: Li X.; Berger R. et al.; Adaptation of a styrene-acrylic acid copolymer surface to water, Langmuir 37, 1571-1577 (2021)

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