

# Polymer Chemistry

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### Interaction between polymer brushes bearing phosphorylcholine and inverse: Phosphorylcholine groups

Phosphocholine (PC) is a zwitterion group which can be found in phosphatidylcholine lipids of the cell membrane in nature. It is widely known that the polymer bearing PC group reveals excellent bio-compatibility and antifouling properties due to extremely weak interaction between PC and protein molecules. In this work, an adhesive interaction of polyzwitterion brushes containing sulfo- and phospho-betaine groups in water was estimated by force curve measurement using scanning probe microscopy. Polyzwitterion brushes with a 110 nm thick (dry state) on a silicon wafer were prepared by surface-initiated atom transfer radical polymerization of methacrylate monomers bearing sulfobetaine (SB), PC, and inverse-PC (iPC). Inverse PC is a zwitterionic group having inverted charge orientation of quaternary amine and phosphate in contrast to PC. Chemical structure of polymers with PC and iPC.

Force curve measurement on (a) poly(MPC) brush and (b) poly(MiPC-iPr) brush surface in water by using PC or iPC functional groups-immobilized silica probe Force curve measurement were performed by atomic force microscopy using a handmade sphere probe. Silica particle ( $d = 20 \mu\text{m}$ ) covered with SB, PC, and iPC functional groups was immobilized at the edge of a tipless cantilever with a small amount of epoxy resin. Adhesion force on the surface of SB and PC brushes were lower than 1 nN, whereas larger force than 20 nN was obtained between PC and iPC brush. A specific strong attractive interaction between PC and iPC were clearly observed. Poly(SB) brushes showed temperature dependency of adhesive interaction corresponding to the UCST behavior in water.

### Biography

Prof. Kobayashi received his Ph.D. in 2000 from the Tokyo Institute of Technology, Japan, and was appointed as an assistant professor in the Faculty of Engineering, Yamagata University, Japan (200-2004). From 2004 to 2005, he worked as a researcher at Kyushu University, Japan, and was appointed as an assistant professor in the Institute for Materials Chemistry and Engineering, Kyushu University, in 2006. He has been a group leader of the JST-ERATO project (2009-2013). After that, he moved to Kogakuin University in 2013 as an associate professor and has been full professorship since 2014. His research interests are polymer synthesis, bio-inspired chemistry, surface and interface science, such as wettability, adhesion, and the tribology of ion-containing polymers. He has been published more than 70 scientific articles, and 20 books/book chapters.

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