Protein adsorption and hydration structure of fluorine-containing synthetic polymers

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Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

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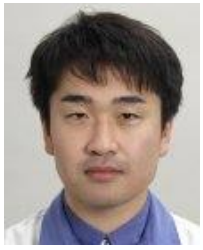

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Recent pubrications about the intermediate water concept for high-throughput screening of biocompatible materials: *ACS Biomater. Sci. Eng.*, 4, 1591-1597 (2018). *Biomacromolecules*, 18, 1609-1616 (2017). *Biomacromolecules*, 18, 3834-3843 (2017). *Biomacromolecules*, 18, 4214-4223 (2017). *Macromolecules*, 49, 8154-8161 (2016). *ACS Biomater. Sci. Eng.*, 2, 2122–2126 (2016). *Biomacromolecules*, 17, 3808-3815 (2016). *Macromolecules*, 49, 2493-2501 (2016). *ACS Appl. Mater. Interfaces*, 7, 18096-18103 (2015). *Langmuir*, 31, 7100-7105 (2015). *Langmuir*, 30,10698-10703 (2014). *Adv. Healthcare Mater.*, 3, 775-784 (2014). etc.

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Poly(2-methoxyethyl acrylate) (PMEA) shows excellent blood compatibility due to the existence of intermediate water (1). Small amount of amino groups was found to change the hydration structure of 2-hydroxyethyl methacrylate when combining in a copolymer structure, which additionally decreased the interactions with lymphocytes (2).

Here we exploit another possibility to manipulate the surface hydration structure of PMEA by incorporation of small amount of other than nitrogen - the hydrophobic fluorine groups in MEA polymers using Atom Transfer Radical Polymerization and the (macro) initiator concept (3).

Focusing on the difference in mobility, two kind of fluorinated MEA polymers were synthesized using 2,2,3,3,4,4,5,5,6,6,7,7,8,8-pentadecafluoro-1-octanol (F15) and poly(2,2,2-trifluoroethyl methacrylate) (P3FM) (macro) initiators appearing liquid and solid at room temperature, respectively. The fibrinogen adsorption of the two varieties of fluorinated MEA polymers was different, that could not been explained only by the bulk hydration structure. Contact angle and AFM measurements reveal that the F15-PMEA reorients in water easily to the surface as compared to the P3FM-b-PMEA which reorientation was suppressed by the small solid fluorinated P3FM block.

These findings illustrate, that in order to make a better bio-inert material, the chains containing sufficient intermediate water need to be efficiently oriented to the water surface.

References:

(1). M. Tanaka, A. Mochizuki. *J. Biomed. Mater. Res.* **2004**, 68A, 684-695.
(2). T. Tsuruta. *J. Biomater Sc.* **2010**, 21, 1831-1848.
(3). K. Jankova, X. Chen, J. Kops, W. Batsberg. *Macromolecules* **1998**, 31, 538-541.