

Bioinspired Polydopamine-modified Surfaces in Surface Charge Tuning of Nanoparticles

Manjit Singh Grewal^{*1}, Hiroya Abe², Yasutaka Matsuo³, Hiroshi Yabu^{*1, 4}

¹WPI-Advanced Institute of Materials Research (WPI-AIMR), Tohoku University, 2-1-1, Katahira, Aoba-Ku, Sendai 980-8577, Japan; ²Frontier Research Institute for Interdisciplinary Sciences (FRIS), Tohoku University, Sendai 980-8578, Japan; ³Research Institute for Electronic Science (RIES), Hokkaido University, N21W10, Kita-Ku, Sapporo 001-0021, Japan; ⁴Institute of Multidisciplinary Research for Advanced Materials (IMRAM), Tohoku University, 2-1-1, Katahira, Aoba-Ku, Sendai 980-8577, Japan

E-mail: grewal.manjit.singh.d3@tohoku.ac.jp, hiroshi.yabu.d5@tohoku.ac.jp

Catechol groups, which are present in the adhesive proteins of mussels, show excellent adhesion properties for a wide variety of materials (1-3). We propose surface modification of poorly dispersive PTFE particles via bioinspired polydopamine-polyethyleneimine (PDA-PEI) which conferred PTFE particles a uniform dispersion in aqueous medium. Precisely tuned concentration of DA and PEI successfully modified the surface charge between positive and negative of the PTFE particles. The reaction mechanism is very straightforward, and thus this kind of surface engineering onto polymers can be applied into the various practical applications in the fields of water treatment, chemical industry, textile, electronics, medical treatment, military, aerospace and so on. Further, specific functional groups can be designed and incorporated into the surface of PTFE@PDA-PEI particles to allow subsequent surface functionalization, such as enzyme and protein immobilization via covalent bonding.

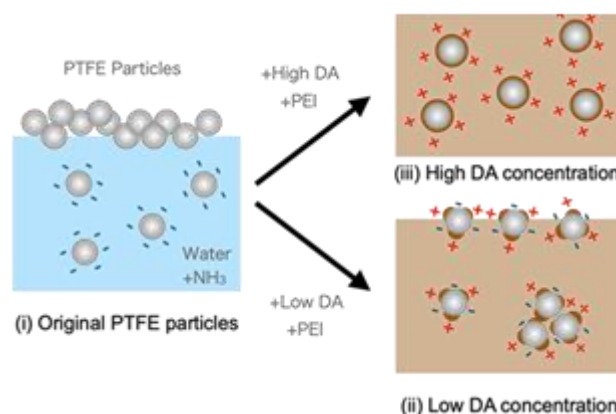


Figure 1: Schematic illustration of PTFE particle dispersion without (i)/with (ii), (iii) PDA-PEI coating.

References:

1. M. S. Grewal, H. Abe, Y. Matsuo, H. Yabu, *Royal Society Open Science*, just accepted.
2. M. S. Grewal, H. Yabu, *RSC Advances*, 2020, 10, 4058-4063.
3. Y. Saito, M. Shimomura, H. Yabu, *Chemical Communications*, 2013, 49, 6081-6083.