Electronic Supplementary Material (ESI) for RSC Advances.

Preparation and characterization of a series of porous anion exchanger chelating fibers and their adsorption behavior of removal cadmium (II)

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3.1 Amination of PP-g-AA fiber.

As mentioned in Section 2.2, PP-g-AA fiber was prepared by a conventional photoinduced graft polymerization technique. Fig. S1 shows the degree of grafting obtained with 10 (v/v)% AA solution at 60 °C for various photoirradiation time in the range of 30–120 min. The degree of grafting linearly increased with an increase in the photoirradiation time due to the rentability of the polymer chain ends as reported by previous workers. More increased degrees of grafting were obtained when the reaction solution including the substrate polymer have been preheated before photoirradiation. However, the difference in the degree of grafting between preheat and non-preheat was reduced with increasing reaction time and disappeared at reaction times greater than 90 min. These results indicate that the effect of preheat on the degree of grafting is mainly related to the initial temperature of reactants whether heating up to reaction temperature or not. From this result, taking the PP-g-AA fiber with various amounts of grafted AA ranging from 10 to 154% as the substrate polymer for amination, the amination reaction was performed with EDA, DETA, TETA and TEPA as the amination reagent.

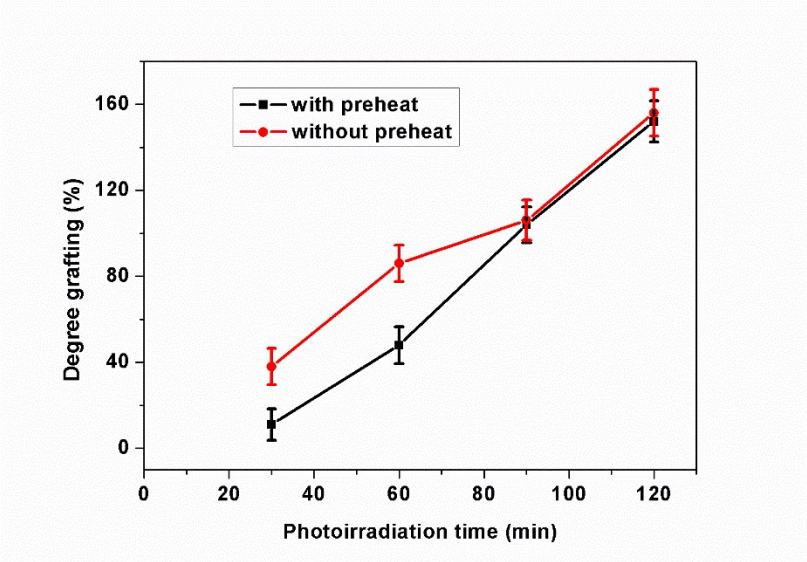

Fig. S1. Degree of grafting of acrylic acid onto polypropylene fiber as a function of photoirradiation time with or without preheat of graft solution for 30 min.

To examine the relationship between the degree of grafting in the PP-g-AA fiber and the degree of amination, 0.5 g of PPg-AA fiber with the degree of grafting in the range of 10–156% was immersed into 60 ml of EDA, DETA, TETA and TEPA, and after adding 2 g of $AlCl_3$ as the catalyst, the degree of amination for each degree of grafting was obtained under the condition of allowing the reaction to continue for 3 h at 120 °C. The results as shown in Fig. S2 show that the degree of amination increased with increase in the degree of grafting up to 112%, and then decreased with further increase in the degree of grafting. It is because the amount of carboxyl group, which could be converted into the aminated form on the PP-g-AA fiber, increased with increase in the degree of grafting. On the other hand, the decreasing trend showing in higher degree of grafting than 112% may be due to the graft layer thickening with the increase in the degree of grafting, and thus the time required for the graft layer to swell and diffuse to enable the carboxyl group of the PP-g-AA fiber to convert into the aminated form becoming longer. From this observation, we used the PP-g-AA fiber in which the degree of grafting was 112%, for following evaluation of amination reactions.

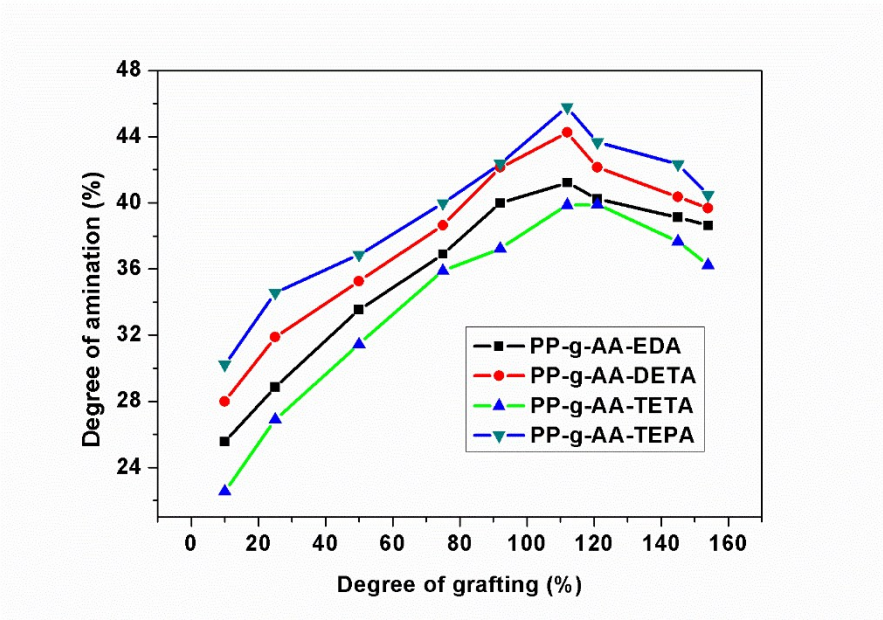

Fig. S2. Degree of amination as a function of degree of grafting.

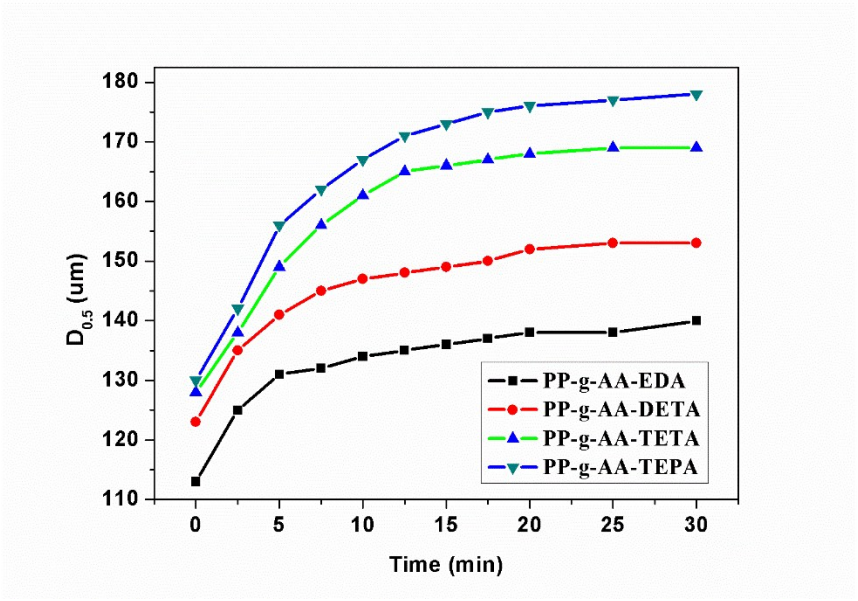

Fig. S3. Median particle diameters ($D_{0.5}$) of PP-g-AA-Am microparticles in ultrapure water.