REGULARLY GRAFTED POLYIMIDES AS A PLATFORM FOR CREATION OF VARIOUS PRACTICALLY IMPORTANT MATERIALS

Yakimansky A.V., Meleshko T.K., Ivanov A.V., Ivanova A.S., Kashina A.V., Tyan N.S., Polotskaya G.A.

Institute of Macromolecular Compounds, Russian Academy of Sciences,
Bolshoi pr. 31, 199004 St. Petersburg, Russia
yakimansky@yahoo.com

Regularly grafted copolyimides (polyimide brushes) PI-g-PMMA, PI-g-PMAA, and PI-g-PDMAEMA (Fig. 1) with polyimide (PI) backbones and polymethylmethacrylate (PMMA), polymethacrylic acid (PMAA), and poly(N,N-dimethylamino-2-ethylmethacrylate) (PDMAEMA) are synthesized by ATRP method.

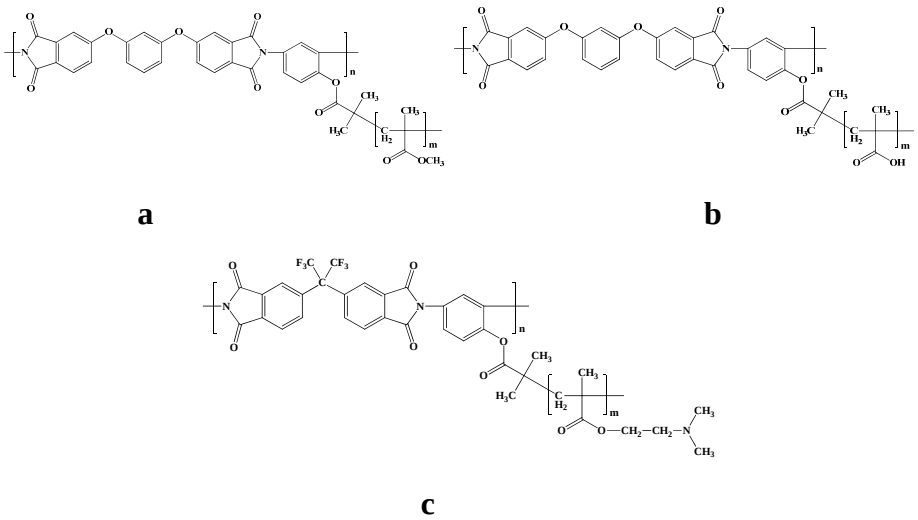

Fig. 1. Structure of polyimide brushes (a) PI-g-PMMA, (b) PI-g-PMAA, and (c) PI-g-PDMAEMA.

It is shown that efficient pervaporation membranes for dehydration of alcohols with the pervaporation separation index PSI>70000 may be prepared from PI-g-PMMA. Moreover, film membranes cast from blends of PI-g-PMMA polyimide brushes with commercially available matrix polymers, like poly(m-phenylene-iso-phthalamide), showed high productivity and selectivity upon pervaporation separation of methanol-hexane mixtures, obviously, due to microphase separation providing favorable conditions for diffusion of permeate molecules through channels formed by interfaces.

It was demonstrated by experiments *in vitro* and *in vivo* that PI-g-PMAA brushes are promising for biomedical applications as nanocontainers for efficient and selective delivery of cyanoporphyrazine agents of photodynamic theranostics to tumor cells.

Polyimide brushes PI-g-PDMAEMA proved to be efficient nanoreactors for the synthesis of stable aqueous dispersions of silver nanoparticles with the mean size of ~10 nm and narrow size distribution which could be used in biomedicine and optoelectronics.

The work is supported by the Russian Science Foundation (grare no. 14-13-00200).