Photocatalytic membranes modified with TiO_2 nanoparticles

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The preparation of membranes with photocatalytic activity is a promising area of membranology, since such membranes have antifouling and self-cleaning properties, preventing their biological and chemical contamination during filtration processes.

The industrial polyethersulfone membranes UF-PES-020H (Microdyn Nadir, Germany) with cut-off 20 kDa were used for modification. A layer of negatively charged TiO_2 nanoparticles was deposited by "layer-by-layer" method.

Photocatalytic activity of membranes modified with TiO_2 was evaluated in oxidation of Rhodamine G. The kinetic curves of the dye decomposition are shown in Fig.

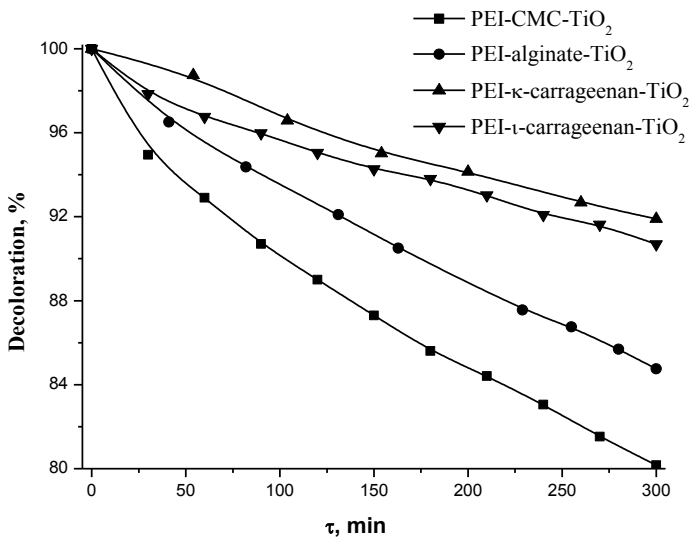

Fig. Decomposition of Rhodamine G on membranes, modified with polyelectrolyte layers and TiO_2 nanoparticles under UV light irradiation: wavelength – 300 nm; the dye initial concentration – 10 mg/L; membrane area - $2 \cdot 10^{-4}$ m^2

Experimental data show that the degradation of Rhodamine G occurs at the reaction of a pseudo-first order, and the time of half-decomposition is only 17-40 h. Such a low activity is caused by a small amount of TiO_2 nanoparticles absorbed on the membrane surface. However, it solves the problem of polymer membrane destruction during filtration and provides antifouling properties, which was proved during protein and milk filtration.