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MOLECULAR IMPRINTING OF DYES IN GLUTATHIONE-SiO_2 MONOLITHIC POLYMER

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Surface molecular imprinting is the technology of obtaining films with fingerprints of molecules on the surface of carriers. It has several advantages in comparison with traditional molecular imprinting through the bulk synthesis: increasing the availability of molecular fingerprints for target molecules and sorption capacity, as well as reducing the cost of sorbent material. In this work, glutathione–silica hybrid monolithic polymer was proposed to produce molecularly imprinted films on the surface of silica microparticles. A monolithic polymer was prepared by thiolene click reaction between glutathione and 3-methacryloxypropyltrimethoxysilane initiated by azobisisobutyronitrile on heating in the presence of methylene blue as a template. Firstly, the samples were washed several times with ethanol and a mixture of methanol: acetic acid. However, the degree of methylene blue removal did not exceed 20%. Optimization of the solution composition allowed increasing the degree of removal up to 27%. For this purpose, seven mobile phases used in HPLC for determination of methylene blue were studied. After washing with a mixture of methanol: formic acid the rebinding was studied: the maximum imprinting factor was 2.9, and the maximum sorption capacity was 29 μmol/g. It was shown that after washing the samples with ethanol, these values were significantly less and amounted to 1.2 and 15, respectively. The binding kinetics of methylene blue to molecularly imprinted and non-imprinted films obeys a pseudo-first-order model with a rate constant of about 2·10-3 min-1. However, the degree of recovery in case of rebinding the template with molecular imprinted samples was 1.5 times higher than with un-imprinted ones and went up to 42%. The surface imprinting was compared with imprinting by bulk synthesis. The maximum imprinting factor in this case amounted to 2.5, and the maximum sorption capacity was 22 μmol/g, which is 24% less than one of the surface imprinted polymer.

Biography

Yuliya Petrova has completed her PhD in Analytical Chemistry from Moscow State University, Russia. She works as an Associate Professor of Analytical Chemistry at Surgut State University, Russia. She has published more than 15 papers in reputed journals and serves as a Director of Institute of Natural Science and Engineering. Her research interests are related to hybrid sorption-kinetic methods of analysis, and recently to surface molecular imprinting on inorganic carriers. Currently, she is working on a project on creation of highly selective sorbents, based on molecular imprinted polymer films on the surface of inorganic materials (TiO_2, SiO_2, layered double oxides etc.) for extraction and determination of biologically active natural compounds.

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