Preparation of magnetic molecularly imprinted polymer for glutathione

Monnapas Wongtipakorn¹,², Angkana Chaipuang¹,², Chalida Phungpanya¹,², Chalermporn Thongpoon³, Theeraphan Machan¹,²*

¹Program of Applied Chemistry, School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
²Center of Chemical Innovation for Sustainability, Mae Fah Luang University, Chiang Rai 57100, Thailand
³Program of Chemistry, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok 65000, Thailand

*E-mail: theeraphan.mac@mfu.ac.th

Abstract: In this work, the magnetic molecularly imprinted polymer (MMIP) for glutathione (GSH) has been prepared. The MMIP was synthesized by solution polymerization method. The surface of superparamagnetic Fe₃O₄ nanoparticles has been coated with tetraethyl orthosilicate (TEOS) by Stöber method and then grafted with methacryloxypropyl trimethoxysilane (MPS). GSH, 4-vinylpyridine (4-VP), ethylene glycol dimethacrylate (EGDMA), and benzyol peroxide (BPO) have been used as template, functional monomer, cross-linking agent, and initiator, respectively. The polymerization was carried out in the mixture of acetonitrile and water under nitrogen gas at 80 °C for 24 h. Transmission electron microscope (TEM), scanning electron microscope (SEM), Fourier transform infrared spectrometry (FT-IR), thermogravimetric (TGA), and X-ray diffraction (XRD) were used for characterization of synthesized MMIP. Experimental results of SEM the MMIP was spherical, FT-IR spectra confirmed by characteristic peak of Fe–O (564 cm⁻¹), Si–O–Si (954 cm⁻¹), O–H (3597 cm⁻¹), and C=C (2970 cm⁻¹) indicates that SiO₂ and vinyl groups are coated onto the surface of the Fe₃O₄ and polymer was polymerized. The MMIP exhibit a weight loss in the range of 20–200 °C and XRD pattern confirmed the presence of Fe₃O₄ nanoparticles in the polymers.

Keywords: Magnetic molecularly imprinted polymer; Glutathione; Fe₃O₄ nanoparticles; Stöber method