

5th International Conference and Exhibition on Analytical & Bioanalytical Techniques

August 18-20, 2014 DoubleTree by Hilton Beijing, China

Long period grating optical fibre sensor with a molecularly imprinted TiO₂ nanothin film

Tao Wang¹, Sergiy Korposh², Stephen James², Ralph Tatam² and Seung-Woo Lee¹

¹The University of Kitakyushu, Japan

²Cranfield University, UK

Molecular imprinting (MI), which was the first challenge by Dickey in 1949, has become a routine technique in materials and analytical chemistry. Inorganic materials for MI have been broadly approached because of their high stability and durability. In this study, a porphyrin molecule, tetrakis-(N-methyl-pyridinium-4-yl)porphine (TMPyP), was used as a template and TiO₂ hybrid film was synthesized on a long period grating (LPG) optical fibre via liquid phase deposition (LPD). This LPG fibre coated with a molecularly imprinted TiO₂ thin film provides several advantages in terms of high refractive index (RI) of TiO₂, high porosity, uniform surface etc.

A 97 µm period LPG was written on a single mode, photosensitive fibre with a cut-off wavelength of 627 nm (Fibercore PS750). TiO₂/TMPyP composite film was deposited on the fibre via LPD for 4.5 h.

Comparing the transmission spectrum of the LPG sensor modified with a TiO₂/TMPyP film before and after heat treatment, shows that the RI of the film was improved at 60°C under highly humid conditions. The template was removed from the coating by submerging the LPG sensor into an aqueous solution of 0.1 M hydrochloric acid. Comparisons of rebinding the template into the matrix with and without prior treatment of 1 wt% ammonia solution to the LPG were carried out. The transmission spectra of the LPG sensor as TMPyP and mellitic acid were rebound to the imprinted film. The TMPyP-imprinted TiO₂ film showed higher selective and sensitive binding towards the template molecule than the non-imprinted pure TiO₂ film.

Biography

Tao Wang received his bachelor degree in 2012 from the University of Kitakyushu (Japan) and now he is a PhD course student in the same University. His research interests include the optical fiber based chemical sensor for biomedical applications.

leesw@kitakyu-u.ac.jp