

## Preparation and characterization of a new sol-gel hybrid based tetraethoxysilane-polydimethylsiloxane as a stir bar extraction sorbent materials

### Abstract

A new tetraethoxysilane-polydimethylsiloxane (TEOS-PDMS) for use as sorbent of stir bar sorptive extraction (SBSE) towards two selected organophosphorus pesticides (OPPs) namely chlorpyrifos and malathion was successfully synthesized through sol-gel technology. Four different molar ratios of TEOS:PDMS (1:1, 2:1, 3:1 and 4:1) sol solutions were prepared and dipped coated onto the surface of a glass-encased stir bar. Extraction efficiency of the prepared coatings towards the two selected OPPs were compared. A number of factors have been found to greatly affect the characteristics and properties of a particular sol-gel coating. Hence, in this study, several sol-gel coating conditions have been optimized using the optimized molar ratio 3:1 TEOS:PDMS to obtain the best coating as the stationary phase for SBSE. The raw OH-TPDMS and TEOS were characterized using Fourier Transform Infrared Spectroscopy (FT-IR) and compared with spectra of the four different molar ratios of TEOS:PDMS. The FT-IR spectrum of TEOS:PDMS showed the co-polymerization between PDMS and hydrolyzed TEOS molecules demonstrating the formation of the hybrid network in the sol-gel hybrid material. Surface morphology of hybrid sol-gel TEOS-PDMS with optimized molar ratio of 3:1 TEOS:PDMS were examined using FE-SEM. The surface of the sol-gel coating seems to be rough and homogeneous. The more rough structure formed by the 3:1 molar ratio TEOS:PDMS provides enhanced surface area which in turn improved sample capacity or adsorption process.