

## Nanochemistry and biotechnology

### Molecularly imprinted polymer-coated silica particles for pre-concentration and detection of atrazine using quartz crystal microbalance sensor

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Atrazine is a triazine based herbicides, and used for controlling the broad leaf weeds in crops such as sugarcane, and grapes. It is found in drinking water and surface water which are highly persistent. Atrazine has toxic nature in wastewater, which affects the human health by immune-suppression, cancer and hormone disruption [1]. Several methods for detection of atrazine from aqueous solution have been reported such as HPLC, GS-MS, and quartz crystal microbalance (QCM). QCM allows dynamic monitoring of chemical interactions, using an oscillating crystal with the ligand immobilized on the crystal surface. The principle of QCM detection is based on an increase in mass on the crystal surface, associated with the binding reaction, and a resulting decrease of oscillating frequency. Thus, a method with fast response and low detection limit can be developed by combining molecular imprinting technique with QCM which has been used in the rapid screening of possible interactions between ligand and target molecules [2]. The silica particles were prepared by sol-gel method, and modified with  $\gamma$ -aminopropyl trimethoxysilane. Then, 2-methacrylamido-aminobenzenesulfonic acid, methyl methacrylate and methylene bisacrylamide were used for preparation of atrazine surface imprinting polymer via “-NH<sub>2</sub>/S<sub>2</sub>O<sub>8</sub><sup>2-</sup>” pair as surface-initiating system.

The atrazine-imprinted silica particles were characterized by zeta-sizer, FTIR, SEM and BET method. The effect of initial concentration of atrazine, the adsorption rate and the pH of the medium on the capacity of atrazine imprinting polymer were studied. Atrazine adsorption capacity of molecular imprinting polymer (MIP) and non-molecular imprinting polymer (NIP) particles was found to be 84.9 and 32.6 mg g<sup>-1</sup>, respectively. Finally, the detection of atrazine was investigated by QCM biosensor after pre-concentration of atrazine from the spiked samples [3]. The binary and QCM systems results show that MIP silica particles have special recognition selectivity and excellent binding affinity for template atrazine molecule.

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