

# Nanocomposites and nanomaterials

## APPLICATION of HYBRID MATERIAL for RECOVERY of ACIDIC HERBICIDES

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Acid herbicides (AH) such as chlorophenoxy acids (4-chloro-2-methylphenoxyacetic acids (MCPA), 4-(4-chloro-2-methylphenoxy)butanoic acid (MCPB), methylchlorophenoxypropionic acid (mecoprop), 2,4-dichlorophenoxyacetic acid (2,4-D) and 3,6-dichloro-2-methoxybenzoic (dicamba) are widely used to control broad leaf weeds and grasses in crops. They are dangerous and toxic organic pollutants. Environmental samples are routinely screened for their presence using Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC). Solid-phase extraction (SPE) of AH onto the surfaces of organopolymeric sorbents, activated carbons or chemically modified silicas with fixed long-chain alkyl groups has become a valuable alternative to liquid-liquid extraction (LLE). However, preconcentration of AH onto these sorbents are not selective and quantitative.

It was previously shown in our study that silica modified with polyethoxylated isooctylphenol (SiO<sub>2</sub>-TX) is an effective sorbent for the preconcentration of AH, such as 2,4-D, Dicamba, MCPA. The aim of present work was to develop new SPE approach for determination of acidic herbicides in the form of their ionic associates with cationic surfactants using SiO<sub>2</sub>-TX.

It is shown that full recovery of acid herbicides from water is at the pH range of 6-8 and flow rate 1.5-2 ml/min at 200 fold excess of cationic surfactants (cetyltrimethylammonium bromide (CTMAB), cetylpyridinium chloride (CPC), tetradecylpyridinium bromide (TDPB), dodecylpyridinium chloride (DDPC), and decylpyridinium bromide (DPB)). The distribution coefficients of acidic herbicides in Henry region reach 223-882 ml/g, and the capacity values are 0.13-0.42 mg/g. The recovery is in the interval of 75-93% (concentration factor is 50). The limit of quantification for 2,4-D is 0.07 mkg/ml, the linear range is in the concentration interval 0.09-0.5 mkg/ml. Chromatographic conditions were as follows: Shimadzu LC, UV detector,  $\lambda = 220$  nm, MP (CH<sub>3</sub>CN + 0.2% H<sub>3</sub>PO<sub>4</sub>, 60+40).

There is a correlation between sorption capacity of SiO<sub>2</sub>-TX and nature of acid herbicides. The sorption of AH onto SiO<sub>2</sub>-TX surface increased in the row 2,4-D > Dicamba > MCPA. We can assume that methyl- (in MCPA) and methoxy-group (in Dicamba) are making steric effects.