Silica-based carbogenic nanodots as adsorbent for adsorption polyaromatic pollutants

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Polycyclic aromatic hydrocarbons (PAHs) can have carcinogenic properties and thus water quality control requires their determination. Common C18 SPE cartridge is unsuitable for recovery of PAHs from lipid media since it is non-selective and can be easily saturated with components of the lipophilic matrix. A significant difference between aromatic and other hydrophobic compounds is a system of π-bonds. It is known that conjugated polycyclic compounds demonstrate a tendency to form π-π molecular complexes with aromatic compounds. Thus, covalent immobilization of such compounds on the carrier surface can result in the adsorbent having increased affinity to aromatic compounds. Recently discovered carbogenic nanodots have a large number of conjugated aromatic cycles and thus they can also form molecular π-π complexes with aromatic analytes. Graphene oxide quantum dots (GOQDs) and carbon dots (CDs) were selected as modifiers of silica gel. The nanoparticles contain different amounts of carboxyl and carbonyl groups, which can significantly reduce the density of delocalized π-electrons, and thus results in changing the macromolecule properties from π-donor to π-acceptor. The nanocomposite with immobilized GOQDs was obtained by covalent immobilization of nanoscale GO fragments when fixing of CDs were performed by combination nanoreactor approach with subsequent adsorption on the silica surface. The adsorbent properties were performed in dynamic SPE modes for the model compounds: anthracene in various aqueous-organic and organic mobile phases and PAHs mixture (17 pollutants) from hexane medium. As a result, the nanomaterials show a high affinity to PAHs with more than 5-cycles.

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