Abstract

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Sample preparation is one of the most critical points in the chromatographic analysis of biological samples. The success of the chromatographic analysis depends on it. The complex character of biological samples and the low concentrations of target analytes have led to the development of selective sample preparation techniques. Because of its universality and selectivity, solid-phase extraction (SPE) is one of the most widely used methods.

Graphene, due to its unique properties (large specific surface area, delocalized π electron system, hydrophobic character), has become a suitable candidate as a substance for the development of a new type of sorbent for SPE.

The submitted thesis was focused on the study of the properties of a modified stationary phase by graphene-based sorbent for SPE. Specifically, it involved the coupling of graphene oxide (GO) sheets to aminosilica gel via an amide bond between the carboxyl groups of GO and the amino groups of aminosilica and the reduction of GO by hydrazine to reduced graphene oxide (rGO). Model analytes with different physicochemical properties, namely acidic ibuprofen (IBU, pKa 5.3), neutral propylparaben (PrP, pKa 8.5), and basic metoprolol (MET, pKa 9.7), were selected for the study of the properties. The conditions for retention and elution of the analytes were optimized to maintain high recovery. The results were compared with extraction yields using commercially available material (aminosilica gel and C_{18} modified silica gel) under the same conditions.

Using the aminosilica gel sorbent modified with rGO as a stationary phase for SPE, its mixed retention mechanism was demonstrated. The experimental results showed that the analytes were likely adsorbed by the large specific surface area of rGO, interacted through π - π interactions, cation - π interactions and hydrophobic effect. Thus, the modified rGO sorbent provided promising results for further development of graphene-based materials.