Development of atrazine imprinted graphene composites based electrochemical sensor for trace level determination of atrazine in real samples

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Abstract

Graphene, a 2D allotrope of carbon with honeycomb structure is an exciting material for many device applications. Since its production in 2004, it has been used significantly to improve the sensitivity in various applications due to rapid electron transfer and high surface-to-volume ratio. This one atom layer thick carbon sheet exhibits many interesting electronic, optical and mechanical properties due to its two-dimensional (2D) crystal structure and possesses high conductivity despite it being an organic compound.

Therefore, an attempt was made to prepare a graphene based electrochemical sensor for trace level analysis of atrazine in real samples. In this regard; graphene oxide (GO) was prepared from graphite by modified Hummers method, later on it was further reduced using polypyrrole to prepare polymer composites. Finally, these graphene composites were made selective for atrazine by molecular imprinting using ionic liquid (1-butyl-3-methyl imidazolium) tetra fluoro borate.

After synthesis, this work includes usage of imprinted graphene composites (IGCs) for the selective and sensitive detection of atrazine in different standards and real samples. Screen Printed Electrodes were modified using the IGC. The voltammetric measurements were performed in NaH_2PO_4 electrolyte. Parameters such as type of electrolyte, its concentration, pH, SPE coating, equilibrium time, frequency, stirring, scan rate, etc were studied thoroughly to detect atrazine using the prepared sensor.

The surface morphology and composition of IGC was studied using a number of suitable techniques such as SEM, FTIR, XRD and Raman spectroscopy.

Key Words: Atrazine, imprinting, screen printed electrode, graphene.