

# **A mechanistic investigation into the covalent chemical derivatisation of graphite and glassy carbon surfaces using aryldiazonium salts**

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## **Abstract**

Modification of carbon materials such as graphite and glassy carbon in bulk quantities using diazonium salts is developed. We used both 4-nitrobenzenediazonium tetrafluoroborate and 1-anthraquinonediazonium chloride to modify graphite and glassy carbon surfaces. Experiments were carried out in the presence and absence of hypophosphorous acid and the mechanism involved in both cases were studied using cyclic voltammetry. The observed peak potentials for both the 4-nitrophenyl and 1-anthraquinonyl modified materials were found to differ depending on whether or not the hypophosphorous acid reducing agent was used. In the absence of hypophosphorous acid the derivatisation reaction was inferred to go through a cationic intermediate, whilst in the presence of the hypophosphorous acid the mechanism likely involves either a purely radical intermediate or a mixture of radical and cationic species. Derivatisation experiments from 5 to 70°C allowed us to determine the optimum derivatisation temperature for both cases, in the presence and absence of hypophosphorous acid. Optimum temperature was 20°C for the former and 35°C for the later.

## **Author keywords**

Aryldiazonium salts; Cationic; Chemical modification; Glassy carbon; Graphite; Mechanism; Radical

## **Indexed keywords**

**Engineering controlled terms:** Bioelectric phenomena; Cyclic voltammetry; Experiments; Graphite; Mechanisms; Reducing agents; Reduction; Salts; Voltammetry

**Engineering uncontrolled terms:** Anthraquinonyl; Aryl diazonium salts; Carbon materials; Cationic species; derivatisation; Diazonium salts; Glassy carbon (GC); Glassy carbon surfaces; Hypophosphorous acids; Mechanistic investigations; optimum temperature; peak potentials; tetrafluoroborate

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