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Low-Potential Detection of Hydrazine with Rhodium

Hydrazine has a wide variety of uses due to its highly reactive reducing ability. It is used as an intermediate for foaming agents for plastics, polymers, antioxidants, explosives, agricultural chemicals and pharmaceuticals. It finds use as an oxygen scavenger and a rocket fuel. Hydrazine is volatile, flammable and toxic. It also can be easily absorbed by the skin and contact with hydrazine irritates skin, eyes and the respiratory track. Hydrazine is considered to be a hazardous air pollutant and as such its maximum recommended value in trade effluents is 1 ppm.

There have been various methods used to detect and determine hydrazine, including spectrophotometric, optical chemical sensing, flow-injection, liquid chromatography and biosensors. However, the use of electroanalytical methods based on the direct oxidation of hydrazine at conventional electrodes has been hindered due to the relatively high overpotentials.

Now, researchers from the University of Complutense of Madrid, Spain, have used cylindrical carbon fibre microelectrodes (CFMEs) modified with rhodium for the low-potential detection of hydrazine under flow-injection conditions (J. M. Pingarrón, I. O. Hernández, A. González-Cortés and P. Yáñez-Sedeño, *Anal. Chim. Acta*, 2001, **439**, (2), 281–290).

Rhodium metallised CFMEs, combining the advantages of metallised electrodes and cylindrical electrodes, were prepared potentiostatically using $RhCl_3$, and characterised by cyclic voltammetry. The electrodes were then tested under flow conditions, beginning at a flow rate of 1.0 ml min^{-1} and an applied potential of +0.3 V. The Rh-CFMEs were found to have good stability during amperometric detection of hydrazine under flow conditions and good electrocatalytic ability for the oxidation of hydrazine and some other organic compounds. The electrode surface did not need to be regenerated. Signal-to-noise ratio was much better at the Rh-CFME than at a Rh-modified glassy C electrode of conventional size. The limit of detection was 6.2×10^{-7} mol l^{-1} hydrazine (~ 20 µg l^{-1}). This flow-injection method could therefore be used to determine hydrazine in trade effluents.