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Gas chromatographic determination of marking substances added to industrial plastic explosives

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Conditions of trace detection of marking substances (MS)-4-nitrotoluene (NT) and 2,3-dimethyl-2,3-dinitrobutane (DMNB) added to plastic explosives with gas chromatography using air as a carrier-gas and sample concentration allowing one to achieve low limits of MS vapor detection are determined. A strong dependence of the amplitude of the chromatographic peak of the MS on humidity of air used as a carrier-gas is revealed. It is advisable to use air which is highly dehydrated to an absolute humidity 8.5 mg/m^3 corresponding to a dew point of -62°C. We used metal grids from stainless steel wire 0.05 mm in diameter with a mesh size of 0.08x0.08 mm^2 to concentrate MS vapors. The grid diameter is 7.5 mm. We used concentrators of the following arrangements: Grids coated with silicone liquid stationary phase (SLP), Tenax and glass wool placed between the grids. It is found that for each concentrator there is a range of linearity between the peak amplitude and sample volume passed through a concentrator. Concentrators with LSP and grids+Tenax are the most efficient for a sample volume of 200 ml (sampling time, 25 s).

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Acid-treated g-C3N4 with improved photocatalytic performance in the reduction of aqueous Cr(VI) under visible-light

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Hexavalent chromium [Cr(VI)] is a troublesome pollutant in the effluents of chromate-related industries. Cr(VI) has high toxicity and high solubility and mobility in water, and can do great harm to the environment and human health. Semiconductor mediated photocatalytic reduction is a effective, economical and environmental-friendly methods for treating Cr(VI) contaminated wastewaters. However, the lack of efficient, stable, cheap and nontoxic visible-light-driven photocatalysts limits the practical applications of photocatalytic technique. Graphite-like carbon nitride (g-C_3N_4) is a metal-free polymer semiconductor with a band gap of about 2.7 eV. It is nontoxic and has good chemical stability, and can be easily synthesized from abundant and cheap CN-containing precursors. Moreover, it has been proved to possess visible-light-driven photocatalytic activity for many chemical reactions. Thus, g-C_3N_4 holds great promise as a visible-light-active photocatalyst for industrial applications. However, the g-C_3N_4synthesized via the traditional thermal condensation methods exhibited low photocatalytic activity, because of its large particles size and small specific surface area. Our studies showed that acid treatment at ambient condition or under hydrothermal conditions can greatly enhance the Cr(VI) adsorption and photocatalytic reduction activity of g-C_3N_4. The reasons accounting for the enhanced Cr(VI) adsorption and photocatalytic reduction activity of the treated g-C_3N_4 were discussed, and the different mechanisms for the photocatalytic reduction of Cr(VI) over g-C_3N_4 and the treated g-C_3N_4 were also proposed.

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