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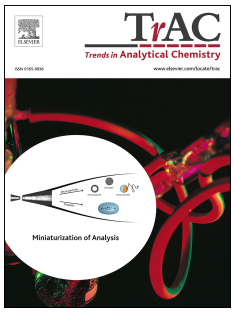

Novel colloidal molybdenum hydrogen bronze (MHB) for instant detection and neutralization of hazardous peroxides

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Novel colloidal molybdenum hydrogen bronze (MHB) for instant detection and neutralization of hazardous peroxides

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Abstract

Ultrasensitive and low-cost detection means for immediate recognition of peroxide explosive compounds such as triacetone triperoxide (TATP) and hexamethylene triperoxide diamine (HMTD) have attracted tremendous attention due to their great significance in home land security. Metal hydrogen bronzes are promising materials for instant detection and neutralization of hazardous peroxides. This study reports on the sustainable fabrication of colloidal molybdenum oxide MoO_3 nanorods. Nanoscopic colloidal molybdenum hydrogen bronze (MHB) were evolved from synthesized MoO_3 via acidic hydrothermal treatment. Colloidal MHB particles with dark blue colour demonstrated complete change in surface properties from hydrophilic to hydrophobic; they demonstrated effective phase transfer from aqueous phase to organic phase. This novel reducing agent did not only offer neutralization of hazardous peroxides but also demonstrated an instant detection of such compounds with colour disappearance. Furthermore, MHB can act as a desensitizer for different hazardous materials by shuttling reactive hydrogen ions rendering them into non-explosive compounds.

Key Words: Hydrothermal synthesis; Colloidal nanoparticles; Explosive detection; Explosive-related compounds; Colorimetric detection; Forensic analysis; Hazardous materials.

1. Introduction

The peroxide explosive-related compounds triacetone triperoxide (TATP) and hexamethylene triperoxide diamine (HMTD) have become popular with terrorists as they are easily prepared from readily obtainable ingredients [1-2]. The O–O bond is the main source of oxygen available for potentially rapid self-oxidation reaction [3]. While most common industrial peroxides have insufficient oxygen to gasify the majority of C and H atoms in the molecule due to limitation of O-O