Montmorillonite Clay Modified N-(1-Naphthyl) Ethylenediamine.Dihydrochloride Composites for the Detection of Nitrogen Dioxide Gas

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Abstract

Air pollution is one of the major environmental risks to human health and historical monuments. According to a 2018 report of WHO (World Health Organization) majority of the world's population is living in places where WHO air quality guidelines are not met. NO_2, a pollutant present in the atmosphere, is a major contributor to deteriorating air. The present study demonstrated the promise of a solid state NO_2 gas sensor at room temperature. Commercial Bentonite was the raw sample and purified to remove carbonates, iron oxides and organic materials which interfere with the clay identification procedure. Two composites of montmorillonite clay were modified with N-(1-Naphthyl)ethylenediamine.dihydrochloride (NEDA) by the process of diazotization in the presence and absence of ZnO. The FTIR peaks present at 1459 cm^{-1}, and 1525 cm^{-1} correspond to N=N and N-O bonds respectively for both composites which confirm the diazotization process. It was found that composite with ZnO showed promising results in the detection of NO_2 gas among other gasses such as SO_2, H_2S and NH_3 resulting in color change from yellowish brown to black. The UV-Visible absorption at the characteristic peak at 347 nm increases linearly with increase in NO_2. The FTIR peak present at 3000 cm^{-1} which corresponds to the amine salt disappears after NO_2 gas exposure. After NO_2 gas exposure, a new peak appears at 1386 cm^{-1} wavenumber in the FTIR spectrum which corresponds to the NO_2 stretch. The results suggest the feasibility of developing a NO_2 gas sensor with high degree of selectivity.

Keywords: *Bentonite, diazotization, NO_2 gas, N-(1-Naphthyl)ethylenediamine.dihydrochloride, montmorillonite*

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