

## **Potentiality of Indian Ocean Manganese Nodule and its Leached Residue as Oxidation Catalyst and Adsorbent**

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### **ABSTRACT**

The detailed physico-chemical characterization of manganese nodules (MN) and water washed manganese nodule leached residues (WMNLR) has been carried out on the basis of chemical analysis, XRD, TG/DTA, FT-IR, surface area and other surface properties. The surface area of MN samples dried at 110 °C ranges from 97 to 130 m<sup>2</sup>/g. Surface area, surface oxygen, surface hydroxyl group and surface acid sites of MN and WMNLR increase up to 400 °C and then decrease with further rise in calcination temperatures up to 700 °C. The catalytic activity of MN samples for CO oxidation and decomposition of VOCs such as acetone, methanol and 2-propanol has been performed in a static bed reactor. The catalytic activity of the calcined WMNLR samples was tested for single step oxidation of benzene to phenol, esterification of acetic acid with n-butanol and bromination of phenol. MN-400 and WMNLR-400 shows highest catalytic activity in the above mentioned reactions. MN and WMNLR are found to have good adsorption capacity for both cations and anions.

### **KEY WORDS:**

Manganese nodule; CO; VOCs; manganese nodule leached residue; benzene oxidation; bromination; esterification and adsorption.

### **INTRODUCTION**

In the recent years, a lot of emphasis is being given on use of natural occurring materials and industrial wastes/byproducts as catalysts in chemical processes and pollution abatement. These materials draw special attention on account of their remarkable surface and textural characteristics; moderately high acidic, basic and redox properties. The future research demands an extensive investigation on naturally occurring materials for catalysis. One such material is polymetallic manganese nodule which contains manganese and iron major component along with Co, Cu, Ni and zinc as minor components (all in the forms of oxides or oxyhydroxides) in alumina and silica matrix. It is expected that such material will find extensive application as catalyst in pollution abatement. One of the major concerns now-a-days to the scientific community as well as environmentalist is pollution control. Oxidation of CO to CO<sub>2</sub> is important and necessary as CO causes a lot of human health hazards. It can be removed from air pollutants by converting it to less harmful CO<sub>2</sub>. Catalytic oxidation of CO has surged due to possible applications in orbiting, closed cycle CO<sub>2</sub> lasers used for weather monitoring, fuel cells and other remote sensing applications. Volatile organic compounds (VOCs) emitted from industrial processes and automobiles are recognized to have major contribution to environmental pollution because of their