PMSE 362: Co, Fe, Cu catalysts supported on halloysite nanotubes for partial oxidation of aromatic compounds

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Body

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The oxidation of aromatic compounds for the production of partially oxygenated derivatives has great scientific and industrial significance. Oxidation of benzene to maleic anhydride or phenol and toluene to benzaldehyde or benzoic acid are important reactions.
Various carriers, such as alumina, silica, cerium and titanium oxides, etc. are used for oxidation catalysts of aromatic compounds. Halloysites are kaolinite clay minerals with a high ratio of Al/Si in comparison with other aluminosilicates. Halloysite nanotubes are 0.2–2 mm in length, 40–70 nm in outer diameter and 10–30 nm in inner diameter, as two-layered aluminosilicate clay, have exhibited promising results as a catalyst support due to their inherent hollow nanotube structure and different outside and inside chemistry.
In this work, different catalysts supported on halloysite nanotubes, with 10 or 20 wt% of cobalt, iron or copper loading, were synthesized by the wet impregnation method. All samples were characterized by TEM, XRD, ICP, N_2 adsorption-desorption isotherms (BET/BJH methods), temperature programmed reduction. Catalysts have been studied in oxidation reactions of aromatic compounds.
Catalytic oxidation of aromatic compounds was carried out in a stainless steel 40 ml Parr batch reactor heated in a temperature-controlled oven. In a typical experiment, aromatic compound (benzene, toluene, o- and p-xylene) and of water were placed to the reactor. Next, Me/halloysite (Me – Co, Fe, Cu) was added. The reactor was sealed at

the air pressure of 2.0 – 5.0 MPa and heated to the reaction temperature (150-250 °C). Reaction time = 1, 3, 6 hours. Halloysite based catalysts showed high selectivity and activity in the oxidation of aromatic compounds in the presence of water. The possibility of using halloysite as carriers of aromatic oxidation catalysts is shown. The dependence of substrate conversion on time and reaction temperature was studied.

Sessions

PMSE: Joint PMSE-POLY Poster Session
Tuesday, Mar 20 6:00 PM
Hall E, Ernest N. Morial Convention Center
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