

Montmorillonite Nanoclay Interaction with 2-Aminophenol and 2-Nitrophenol

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ABSTRACT:

The interaction of 2-aminophenol and 2-nitrophenol compounds with the structural iron of montmorillonite nanoclay was studied using Mössbauer spectroscopy in order to determine what effects have the groups of withdrawing and donating electrons on the phenol ring and how they affect the nanoclay structural iron. 100 mg of the organic compound was dissolved in 50 ml distilled water in 100 ml volumetric flask. 1 gm of the montmorillonite nanoclay was added to this solution. The mixture was stirred for 24 hours in order to reach equilibrium, then filtered. It was found that the structural iron (III) of the montmorillonite nanoclay sample can be reduced to iron (II). The reduction process depends on the substituent on the phenolic ring. At high pH, reduction takes place if the phenolic ring has electron donating substituent like NH₂, while no reduction occurs if the phenolic ring has electron withdrawing substituent like NO₂. The process involves electron transfer from the hydroxyl group on the compound substituted with donating group, to the active site at the iron atoms within the montmorillonite lattice. This site is considered to be Lewis acid.

Keywords: Mössbauer spectroscopy nanoclay Montmorillonite phenolic ring donating substituent withdrawing substituent.