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Organically modified Indian smectite clay as rheology modifier

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Statement of the problem: The commercial organosmectites manufactured by patented methodology are used as rheology modifier/ thixotropic agent in industry manufacturing paints, inks, varnishes, coatings, adhesives, greases, cosmetics and medicines. The organosmectites synthesized using clays and organic modifiers and/or methodologies different/other than the one patented cannot match requisite rheological properties and parameters of the end use. In the present investigation, the attempts have been made to explore the means/approach that can achieve the requisite rheology of the end applications using the non-commercial organosmectites.

Methodology & Theoretical Orientation: Cetrimonium-, 1-Hexadecylpyridinium- and Benzyldimethyloctadecylazanium-smectites derived from Indian (Rajasthan) smectite, and quaternary ammonium salts viz. Cetrimonium bromide, 1-Hexadecylpyridinium chloride and Benzyldimethyloctadecylazanium chloride were studied for rheological properties and parameters of their methylbenzene-dispersions. The effect of concentration of smectite and polar activator has been studied. A commercial organobentoniteBentontie-34 was for comparison.

Findings: The organic density, of quaternary ammonium salts influenced the basal spacing, particle size and bulk density of the organosmectites. Rheological reinforcement of methylbenzene-organosmectite-dispersions prepared using sheering technique demonstrated shear-thinning flow behavior, degree of shear-thinning, stability of the gel structures and yield stress. The potential of organosmectites exhibited the order: Bentone-34 >Benzyldimethyloctadecylazanium-smectite >1-Hexadecylpyridinium-smectite > Cetrimonium-smectite. Whereas the efficiency of the organosmectites to improve the rheology of the methylbenzene-organosmectite-dispersions demonstrated the sequence as follows: 1-Hexadecylpyridinium-smectite > Cetrimonium-smectite > Bentone-34 > Benzyldimethyloctadecylazanium-smectite. The organosmectites with polar activator having smectite based 65 wt.% concentration exhibited optimum rheological enhancement. Ostwald–de Waele relationship and Casson models/equations have been used to describe the rheological properties of methylbenzene-organosmectite-dispersions and respective rheological parameters have also shown the trend same as indicated by the rheological properties.

Conclusion & Significance: So far as conventional sheer method is concerned Bentone-34 is observed to be the most efficient clay in enhancing the rheology of methylbenzene-dispersions, but when ulrtasonication used for preparing the methylbenzene-dispersions the rheology enhancement by 1-Hexadecylpyridinium- and Cetrimonium-smectites are superior to Bentone-34

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