

CHAPTER - 2

SCOPE AND OBJECT

A versatile range of chemical reactions including electron transfer, condensation and polymerization may be affected with the restricted and well defined spaces between contiguous charged sheets of various aluminosilicates. Surface property of clay minerals can be altered by incorporating organic entities and thereby forming clay-organic complexes. The preparation and use of such complexes in various fields are techniques which are widely practiced. The sheet like layer structure with negatively charged surface plays the profound role in the interaction between the clay mineral and organic compounds. Besides, in the preparation of clay-organic derivatives with simple polar organic compounds also as catalyst in various chemical reactions the use of clay is extensive.

The activity of the clay minerals in influencing the polymerization reaction is of considerable interest. Clay minerals initiate the polymerization yielding both extractable and non-extractable polymer-clay adduct. However, the success of initiation with clay minerals depends upon the nature of the monomer molecules and the reaction media. Interests regarding the clay-polymer composites have broadened because of great potential and practical importance of such system in agriculture, foundation engineering and varieties of industrial processes. The flexural and tensile strengths of clay-polymer adducts are dependent on the ratio of grafting and non-grafting polymer in clay-polymer composites. Initiation of polymerization by clay is mostly

successful only in non-polar media. The polymerization with clay minerals in polar media is effective with the use of clay-chemical initiator adduct. It is of importance to point out at this stage that the aqueous polymerization where clay mineral is an essential component is comparatively meagre.

Keeping all these in mind the present investigation has been undertaken proposing the aqueous montmorillonite/thiourea system as a new polymerizing initiator. It is to be noted that montmorillonite alone is incapable of initiating the polymerization of methyl methacrylate. Montmorillonite possesses both the electron accepting and donating capacities depending on its structural composition, the nature of the reactants and the reaction media. In the present system under investigation, if montmorillonite is capable of accepting electron or in otherwords, acts as an oxidant, it is reasonable to expect the generation of the amido sulfenyl radical in the interaction between the montmorillonite and thiourea. The amido sulfenyl radical once produced may be capable of initiating the polymerization of organic monomers similar to the other redox initiating systems involving thiourea as reductant. The mechanism of the reactions may be suggested only after scrutiny and careful consideration of the experimental results. The investigation is expected to be informative for the better understanding of clay-organic interactions and elucidating the uncertainties in the polymerization processes with the aforesaid system.

In the heterophase polymerization of methyl methacrylate, the montmorillonite/thiourea initiating system may result in producing the high molecular weight polymer with high conversion. A considerable amount of clay-polymer adduct is highly expected in the polymerization of monomer adsorbed on the mineral surface (mostly internal). Low cost, high availability of the clay mineral and easy operational condition are also favourable points for this initiating system. The limitations of proposed scheme will also be investigated.

According to earlier workers, nitrile monomers fail to homopolymerize in presence of clay minerals. In view of this, the ability of the montmorillonite/thiourea initiating system producing copolymers of methyl methacrylate with acrylonitrile or methacrylonitrile and no homopolymers of the nitrile monomers, may be an interesting study. Attempts may also be made to substantiate our ideas with regard to the polymerization of the monomers in terms of kinetic, thermodynamic, spectroscopic and electrochemical studies.