Among the widely distributed geological sediments clays are most important and are the oldest ceramic raw materials. Besides the pyrochemical changes such as dehydration, phase transformation, solid reaction, sintering, vitrification etc., which are of great significance in many industries, the plastic property of the clay is very important.

The clay-water system affords an extremely interesting part of colloid science through which various mechanisms of electro-kinetic interaction as a function of electrolyte addition can be studied. From the technological point of view plasticity is of paramount importance and a large volume of literature has been accumulated over this mechanical property of clay-water system.

Three properties are important; viscosity in dilute sols, thixotropy in sols and gels of intermediate concentration and plasticity in pastes. A great deal of present-day ceramic technology still exploits this property of deformability and several other ceramic manufacturing techniques such as casting, glaze and enamel application invoke one part of the definition.
of rheology - the flow property of the suspension.

Clay minerals fall under the group of layer lattice structures where three oxygen atoms of each silica tetrahedron are linked to similar units and one oxygen of each group of four is not fully satisfied electrically and required to be linked to external cations. The sheets of silicon-oxygen atoms are capable of extension in two directions at right angle. Definite layers are formed which are stacked one above the other and the bonds between each layer are relatively weak. Each mineral layer or plate is an independent unit and must be electrically balanced and each cation is coordinated with anions in a way dependent on their size ratio. In case of montmorillonite the layers are not balanced within themselves and invite ions to be adsorbed on the surface of the layer. As montmorillonite minerals widely differ in their structural constituent a single study on colloidal behavior cannot generalise their interaction nature. The viscosity relationships in the montmorillonite group are more complex and interesting because of large amount of variation in the structure, high CEC and less rigid network. By virtue of the surface negative charge, clay particles have the capacity to absorb positively charged ions and variations of these exchangeable cations have pronounced and important effect on the stability of the suspension of bentonite which is the subject matter of present investigation.
Bentonite finds ceramic applications in bodies, glazes and enamels to improve plasticity or to increase thixotropy. Besides their crystal structure, the sensitivity towards electrolytes of bentonite in aqueous phase depends on their extremely fine grain size. The small particle size combines with high content of adsorbed ions in the inter-crystalline water layer and on the edges enables bentonite to bind more water than other clay minerals. As this clay is very much sensitive to the composition of aqueous phase, present work has been undertaken to study systematically the interactions with progressive addition of electrolytes, polyelectrolytes and also mixture of both to bentonite in different cationic forms. Particle association in clay suspension is related to the concentration and this effect was studied in dilute medium where the flow was of purely Newtonian in nature.

The knowledge of controlling the sediment property by controlling the degree of stability or flocculation of suspensions is very important in technology. In the present investigation the swelling behavior of bentonite, one of the most important characteristics of this type of clay has been studied in dilute medium during interactions with electrolytes.

Though the protective and sensitising effect of hydrophilic colloids on hydrophobic sol has been known for a long time it is relevant to point out that ceramic materials still
provide difficult problem to the rheologist and an exact rheological description of most of the ceramic materials has yet to be devised. Because of the technical importance of plasticity, an attempt has been made to study the interaction of bentonite in different cationic forms with electrolytes and hydrophilic macromolecular compounds in the aqueous system applying the concept of non-Newtonian rheology. The nature has been characterised through the measurement of rheological parameters such as yield value and plastic viscosity.

As the concentration of the bentonite is increased, viscosity maxima eventually become the zone of thixotropy - an important property by virtue of which bentonite is often characterised among the other clay minerals. This property of isothermal self-building sol-gel-sol transformation has been utilized in many industries such as petroleum drilling, enamelling, paints etc. The physical concepts of this behavior is very much complicated and it may be regarded as a half-way state in the process of coagulation. The final part of the present investigation deals with the generation of thixotropy in bentonite suspension containing different cations in the exchangeable position by controlled addition of electrolyte. The relative influence of the exchangeable cation has also been compared with respect to thixotropic gelation in presence of a particular electrolyte. Thixotropy may be mechanically defined as the limiting slope of
the viscosity - reciprocal shear curve when the latter tends to zero i.e. for infinitely high rates of shear. The measurements with concentrated suspensions have been carried out in rotational cup and bob viscometer designed according to McMichael model.

The stability of the clay suspensions is greatly dependent on the type of the double layer which is formed around the particles by the compensating cations. These cations are exchangeable and though the electric double layer on the layer surfaces has a constant charge which is determined by the type and the degree of isomorphous substitution, the nature of the exchangeable cations in the clay also plays a role in the process of coagulation or peptization as has been reflected through the present investigation.)