CP-I-14

CATIONIC POLYELECTROLYTES AS INHIBITORS FOR SHALE REACTIVITY IN WATER BASE DRILLING FLUIDS

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In the recent years, with the increasing environmental restrictions on the use of mineral oil base fluids, special attention has been paid towards polymeric water base systems[1]. Cationic polymer systems received increased attention in the early 1990's due to their ability of inhibit reactivity of shales[2,3], although the mechanism through which they act is not well understood. In this work, it was studied the adsorption, on bentonitic clay, of a series of cationic polymers having different molecular weights (PDADMAC-HMW, MMW, LMW and co-AM). The adsorption experiments were carried out through the addition, to a clay suspension, of increasing amounts of polymer. All experiments were carried out under the same conditions using distilled water and saline 10%(p/v) KCl solutions. After being centrifuged, the solid remains were characterized by Organic Carbon Analysis (OCA), Thermogravimetric Analysis (TGA) and Scanning Electron Microscopy (SEM). Linear Shale Swelling (LSS), an usual petroleum industry test, was also used to evaluate the inhibition capacity of the polymers. All polymers studied were able to adsorb on clay surface, displacing the water previously adsorbed. The highest molecular weight polymer showed less adsorption (Figure 1). The TGA results showed that the clay water content, after adsorption, depended on the molecular weight of the polymer and the presence or not of potassium ions. The highest amount of polymer adsorbed on clay and the lowest water content were obtained with the lower molecular weight polymer, as shown in figure 2. An increase in the ionic strength of the solution implies in a random coil conformation of the polymer and the adsorption takes place in the form of loops and tails, leading to the greater amount of material adsorbed[4]. The LSS test showed that all polymers were good inhibitors of clay swelling (Figure 3). The copolymer polycation showed better results than the homopolymer, suggesting that two different mechanisms may be present in

the inhibition process. SEM images showed that polymer adsorption protect the shale surface from the water attack (Figure 4).

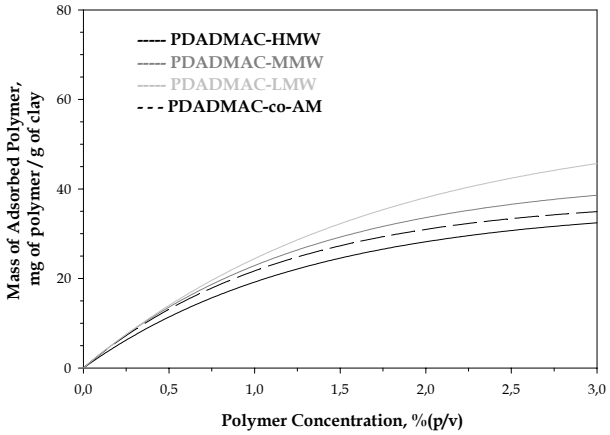

Figure 1: Adsorption Isotherm

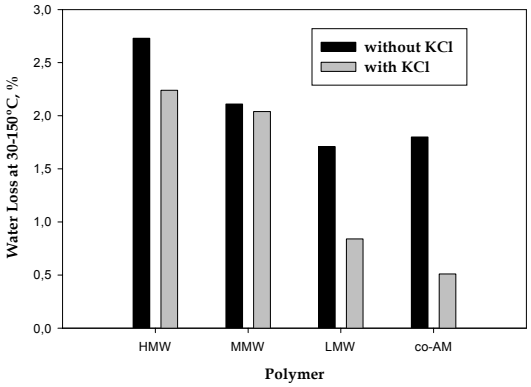

Figure 2: Water Loss at 20-300ºC

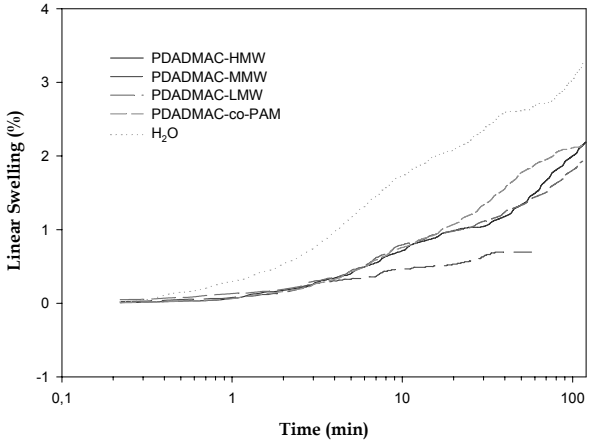

Figure 3: Linear Shale Swelling Test

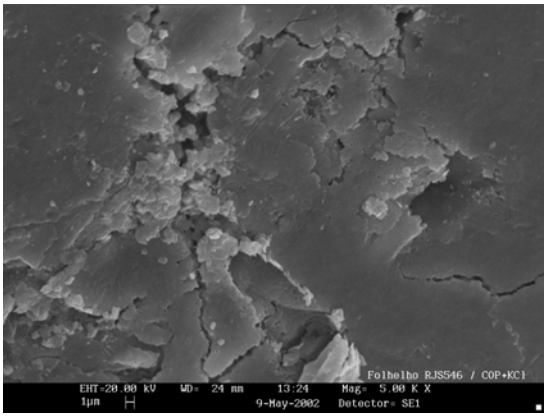

Figure 4: SEM image

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