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Rheological Properties and Application of High Molecular Weight Polyacrylamide in Sand Stabilization in UAE

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Polyacrylamides constitute a class of polymers that can entirely dissolve or swell in water to form a solution or hydrogel respectively. Free radical polymerization of acrylamide monomer, using both solution and inverse-emulsion polymerization, was applied to produce polyacrylamide with various molecular weights. This investigation was focused on the production of polymers with different molecular weights, depending on monomer to initiator ratio. Experimental conditions were designed to produce high molecular weight polymers that can be used in stabilization of sand dunes in the arid regions. Synthesized polyacrylamide samples were characterized using Gel Permeation Chromatography and solution viscosity in order to determine the molecular weights and molecular weights distribution. The rheological behavior was also investigated in different polymer concentrations and at various temperatures using Brookfield Rheometer. Lab-scale wind tunnel was used to determine the stability of the sand before and after treatment with the polymer. Compressive stress-strain test was also used to establish the mechanical behavior of the polymer-sand composite under controlled compressive load up to failure. The results showed that the use of high molecular weight polymer gave excellent mechanical and thermal stability.