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Recent Developments in Environmentally Sustainable and Cost-Effective Construction Materials

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The effects of additives on the flow characteristics of drilling muds used in various drilling operations, including oil and gas wells, must be better quantified. In this study, acrylamide polymer was used to modify water-based bentonite mud to reduce the yield point and maximum shear stress produced by the mud during the drilling operation. The bentonite content in the drilling mud was varied up to 6% (by weight). Based on the X-ray diffraction (XRD) analyses, the major constituents of bentonite were montmorillonite (MMT, (Na,Ca)0.33(Al,Mg)2(Si4O10)(OH)2·nH2O), feldspar (Albite, NaAlSi3O8), kaolinite (Al2Si2O5(OH4)), Beidellite ((Na,Ca0.5)0.3Al2((Si,Al)4O10)(OH)2·nH2O) and quartz (SiO2). Bentonite was modified using a water-soluble polymer solution before being used in the drilling mud. The rheological properties of bentonite were characterized from a very low strain rate to a relatively high strain rate to determine the nonlinear behavior of the shear-thinning drilling mud. The polymer modification reduced the yield point by 26–66% based on the bentonite content in the drilling mud.

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