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Influence of Na^+, K^+, Mg^{2+}, Ca^{2+}, Fe^{3+} on Filterability and Settleability of Drilling Sludge[#]

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Abstract Solid-liquid separation is a vital step in drilling sludge disposal, and the filterability and settleability of drilling sludge are the main evaluating indicators for the separation process. The influence of Na^+, K^+, Mg^{2+}, Ca^{2+}, Fe^{3+} on drilling sludge filterability and settleability were investigated in our research. The water content, filtration rate, supernatant volume and supernatant turbidity were measured to evaluate the filterability and settleability of drilling sludge. Meanwhile, the zeta potential, specific surface area of sludge flocs, particle size distribution and Fourier-transformed infrared spectra were employed to clarify the influencing mechanism. The experimental results showed the filterability and settleability of drilling sludge were related to concentration and types of cations. The Mg^{2+}, Ca^{2+}, Fe^{3+} performed better than Na^+, K^+, and the cations with smaller hydrated radius got superior solid-liquid separation behavior at same valence. Finally, the spectra indicated that no chemical adsorption occurred between inorganic cations and drilling sludge flocs. The variation of surface charge and flocs growth after adding different inorganic cations were the reasons for the changes of the filterability and settleability.

Keywords drilling sludge, inorganic cations, filtration, settleability, adsorption

1 INTRODUCTION

With rapid development of drilling technology, large amount of sludge has been produced during drilling operation. Drilling sludge is aqueous suspension of charged hydrophilic colloid, which consists of swelling clays, fine mineral particles, heavy metals and organic materials such