Cement placement in damaged shale rocks: effects of shale properties

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Background
Previous studies have shown that wellbore damage can vary in geometry and dimensions. Parameters such as shale type, bedding orientation, the drilling procedure and application of stress where shown to have an influence.

The main overall motivation for this project is to study whether drilling-induced damage at the near-well shale interface can produce significant leak paths, and if so, whether cement can penetrate and seal those leak paths.

Objective
The objective of this work is to focus on the shale properties and more specifically how the wettability of the shale wall interface can have an influence on the bonding of cement.

• How will cement bond to different shale rocks with varying degree of oil/water wet surface?

Method
• Stage 1: subject hollow shale rocks to in-situ stress conditions to create wellbore damage.
• Stage 2: Circulate water or mineral oil through borehole to achieve oil- or water-wet surface.
• Stage 3: place cement in borehole using piston cylinder.
• Stage 4: scan cemented sample using X-ray CT
• Stage 5: segment and visualize non-cemented volume from CT data using AVIZO software

Cementing water wet shale surface
• Proper bonding of cement at water wet shale surface.
• Difficult to maintain bulk cement properties due to shale instability

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