Differences in the Texture of Chalk as observed by NMR

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Differences in the Texture of Chalk as observed by NMR

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In this study, three cases under investigation illustrate how changes in the surface-to-volume ratio of chalk affect the low-field Nuclear Magnetic Resonance signal:

1. Outcrop chalk saturated with high salinity brine showed that saturation with divalent ions can cause major shifts in the T2 curve.

2. Fluid samples where precipitation reactions caused shifts in the T2 curve due to the creation of crystals within the fluid.

3. Two types of chalk with different surface-to-volume ratio, saturated with the same brines produced different NMR signals.

- NMR signal decay time (known as relaxation) is affected by the solid phase:
  - Differences in the rock texture
  - Precipitants within the pore space
  - Variations in the bound water thickness

- NMR Relaxation in the homogenous system of brine saturated chalk:

- Outcrop chalk with low surface-to-volume ratio saturated with divalent ions:

- Outcrop chalk with high surface-to-volume ratio saturated with divalent ions:

- Brines that contain precipitants after contact with chalk:

- NMR Signal

- T2 Distribution of chalk with high vs. low surface-to-volume ratio

- T2 Distribution of solutions that contain precipitants

- Low field NMR was successfully used to identify changes in the surface-to-volume ratio.

- Samples with high surface-to-volume ratio result in smaller relaxation times. Samples saturated with Mg-rich brines, brines containing precipitants, and chalk with different texture illustrate this.

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