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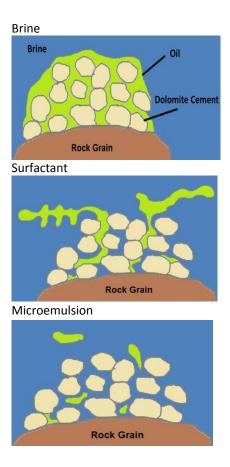
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Graphical abstract



Highlights

- The impact of rock characteristics on the complex fluid-rock interactions is investigated
- MEs enhance the immiscible displacement (or mobilization) of NAPL by decreasing IFT and oil droplet size
- MEs promote the desorption of NAPL from rock surfaces (or solubilization) thereby altering their wettability
- At low concentration, MEs outperform surfactants in rocks containing carbonate cements

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