

Fig. 7: Incorporation of nanoscale interfacial reactions into a reactive transport model.

a

Surface

Carbonated

CH-depleted

Intact

CO₂ attack direction

CO₂-saturated brine

Reacted cement matrix

b

- No consideration of nanoscale mechanisms

Depth, μm

Reaction Time, Days

□ CH Front (Exp.)

○ Inner Carb. (Exp.)

△ Outer Carb. (Exp.)

— CH Front

— Inner Carb.

— Outer Carb.

c

- Incomplete pore-filling
- Nucleation
- Solubility difference

Depth, μm

Reaction Time, Days

□ CH Front (Exp.)

○ Inner Carb. (Exp.)

△ Outer Carb. (Exp.)

— CH Front

— Inner Carb.

— Outer Carb.

CH-depleted

Surface dissolution

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