CHEMICAL OXIDANT STIMULATION OF COAL SEAMS TO INCREASE COAL SEAM PERMEABILITY

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Research Question:
Can the permeability of a coal seam be enhanced by using an in-situ oxidant treatment?

Objectives:
- Investigate effects of various oxidizing chemicals on the coal permeability;
- Develop a fundamental understanding of the oxidizing mechanisms;
- Rank the different chemical treatments and identify those offering the most promise for particular coals.

Possible effects of oxidants:

1. Coal cleat surface could be etched, leading to an increase in cleat aperture. Expectation: Increase in permeability.
2. The oxidant molecules could penetrate into the coal structure and swell the coal internally, leading to a decrease in cleat aperture. Expectation: Decrease in permeability.
3. Coal breakage could occur, possibly preceded by coal swelling. Expectation: Increase or decrease in permeability.

Methodology: Swell/shrink test
- Identify coal particle size change
- Visualize coal oxidation process

Results:

- NaClO
  - Pre-treatment
  - Post-treatment
  - Projection area
  - Swell/shrink ratio: 1.2

- KMnO₄
  - Source: Bowen Basin NC2
  - Rank: 1.08
  - KMnO₄ Concentration: Breaking

Conclusion:
1. NaClO and KMnO₄ react with the Bandanna coal, causing swelling and breakage.
2. Increasing oxidant concentration causes increased swelling.

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