CHEMICAL OXIDANT STIMULATION Of COAL SEAMS To INCREASE COAL SEAM PERMEABILITY

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Introduction
Low permeability renders many coal seam gas (CSG) resources sub-economic. Oxidants are capable of reacting with coal to form soluble products, and could therefore be used to increase cleat aperture.

Desired effect of oxidants on coal permeability
Coal cleat surface could be etched, leading to an increase in cleat aperture. Expectation: Increase in permeability.

Methodology:
- Swell/shrink Test: Camera observation & image analysis

Fig. 1 Schematics of cleat aperture increasing by oxidation
Fig. 2 Schematic of swell/shrink test procedure

Results & Discussion:
- Coal flooding test & CT scanning

Fig. 3 Coal stimulation rig and CT Scanning Image

Fig. 4 Coal CT Scanning 3-D views before and after H2O2 and NaClO oxidation.
- Exclusively massive void space was generated in bright coal band after oxidation.
- No attack on dull coal
- No change in vertical permeability.
- Horizontal permeability expected to be very high.
Need to be investigated.

Oxidative mechanism and product
NaClO was reported to oxidize the side chain on the benzene ring rather than the benzene ring itself.

The products from coal oxidation in NaClO are mainly composed of benzene carboxylic acids, chloro-substituted alkanedioic acids and CO2 if strong oxidation happens [1].

Coal dissolves and appears to swell at the same time, which may be undesirable.

Conclusion
- Coal tends to swell in NaClO without confining pressure.
- Coal swell/shrink ratio increases with increasing oxidant concentration.
- NaClO can lead to coal dissolution and breakage.
- Oxidants can generate massive void space in bright coal band.


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