

Capillary Seal Summary 2014

Here is a brief description of papers my group has published regarding capillary seals.. Broadly the ideas covered are (1) large scale chemical patterns related to gas washing, and (2) capillary sealing. Also included are some papers on CO₂. All of these relate to gas fingering, pockmark formation, and hydrate crystallization in one fashion or another. There are a lot of things that could be followed up, but the one we discussed particularly is using geochemical patterns of ~100 km scale or greater to try to understand the way gas (including N₂ and CO₂), oil and water move in sedimentary basins. The main need is a good data base and the basins around China would be ideal as they are currently active and hot and deep.

The gas washing idea is introduced in the two short papers under 1. It is discussed in great detail in the reports under 2a. The capillary seal idea is reported in the GCSSEPM series of papers under 2b. The paper listed in 3 is a broad review of fluid flow in the upper crust, and the paper in 4 is a fun application of the non-linearities involved in capillary sealing. I suggest you read 1 first, then 3 and 4, and finally dig into the details in 2.

The CO₂ paper stands alone and is described in 5.

1. Summary gas washing papers.
 - a. Gastips (2003) [83] summary of the Gas Research-funded project on capillary seals
 - b. Leading Edge (2004) [91] summary paper covering much of the same ground
2. Details are given in the GCSSEM series of papers and in the GRI report.
 - a. The GRI report contains:
 - i. Volume I [78]: a summary overview
 - ii. Volume II [79]: description of the gocad geochemical data base
 - iii. Volume III : organic geochemical analyses
 - iv. Volume IV [80]: gas washing analysis
 - v. Volume V [81]: basin modeling
 - vi. Volume VI [82]: chemical alteration modeling
 - b. The GCSSEPM paper series contains:
 - i. I_Cathles [69] Overview of our capillary seal concept
 - ii. II_ShosCath [70] Capillary seal laboratory experiment
 - iii. III_RevCath [71] Compaction analysis of 43 wells, Eugene I. 330

iv. IV_ErenCath [72] Impact of cap seals on oil recovery

3. The 2005 [97] Cathles and Adams paper is a long review of fluid flow and resources in the upper crust with an extensive appendix discussion of the concept of dynamic permeability.
4. The 2007 [102] Geofluids paper discusses the non-linear dynamics of capillary sealing and how basin-centered gas zones could act as gas pulsars and form lead-zinc deposits.
5. The 2007 [105] CO₂ generation and titration paper describes how I have modeled CO₂ generation (by formation of clay and acid attack of carbonates) and titration (by bac-reaction of Ca- Fe- and Mg-aluminosilicates to produce carbonates).

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