

## **Genesis of Pre-Salt Lacustrine Microbialite Reservoir of Lower Cretaceous Barra Velha Formation in L Block, Santos Basin, Brazil**

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### **Abstract**

As a large ultra-deep-water oil prospect located in the Santos Basin, SE Brazil, there are 3.7 to 15 billion barrels reserves under 2000m of water and further 5000m under sand, rock, and shifting salt layer in L Block. The microbial limestones in the Barra Velha Formation are one of the two main reservoirs (the other one is the coquinas limestone in the Itapema Formation). The microbial limestones include spherulite, stromatolite, oncolite, and oolite. The porosity of the microbial limestone section is 10-20% and the permeability is 300-3000md.

Seismic profiles, cores, and thin sections were used to study the sedimentary facies and reservoir characteristics. Samples were collected to simulate the solution-rock reaction genesis under HPHT.

The reservoir spaces could be divided into primary pores and secondary pores. The primary pores could be divided to 4 kinds: 1) Framework pores (created within and between the dominant deposit structural features such as Arbustiform Stromatolites); 2) Boring pores (created by various bio-erosional agents); 3) Detrital pores (intergranular or intra-granular/moldic pores among grainstones or interbedded clastics); 4) Early cements dissolution during the earliest phases of diagenesis. The secondary pores could be caused by penecontemporaneous dissolution (In the top of the sequence or HST), karstification, and burial dissolution. Seismic profiles show that the widespread volcanic channels in this area could be associated with faults and fractures, which could help the transportation of dissolution fluids.