

## **Modification of Pore Geometry and Petrophysical Characteristics of the Upper Jurassic Smackover Formation Thrombolite Reservoirs after Dolomitization**

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### **ABSTRACT**

The Upper Jurassic Smackover Formation thrombolite facies is a prolific reservoir in southwestern Alabama. Most of the Smackover Formation thrombolite facies discovered so far were dolomitized, and the original depositional characteristics of the rock are obscured. However, the thrombolite facies at Little Cedar Creek Field (LCCF) were only lightly dolomitized, and most of its depositional texture is well preserved.

Diagenesis caused important changes in the Smackover Formation thrombolite reservoir in LCCF. During the dolomitization process, the grains and early calcite cements were progressively replaced by dolomite crystals, whereas some of the remaining calcite was progressively dissolved, and intercrystalline porosity was generated. This process also caused the number of meso- and macropores to increase, and pore geometry and pore-throat size became more homogeneous.

The southern portion of the Smackover Formation thrombolite at LCCF is only partially dolomitized, and its porosity and permeability values are higher than coeval limestone units, varying from less than 10% to 15–20% porosity on average, and from less than 50 md to 100–600 md permeability on average (less than 10 md to 50–250 md for the geometric mean). The thrombolite units at Appleton and Vocation fields are intensely dolomitized. Their petrophysical characteristics are more homogeneous vertically and laterally, and they also have higher porosity and permeability values (average of 175–356 md of permeability and 13–17% of porosity) than those of the partially or nondolomitized thrombolite at LCCF.

This study shows that increasing dolomitization improved reservoir quality of Smackover Formation thrombolite units in southwestern Alabama by modifying its pore system.