

## **Lithofacies, Cycles and Diagenesis Controls on Dolostone Reservoir Quality for the Lower Cambrian Longwangmiao Formation in Central Sichuan Basin, South West China**

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### **ABSTRACT**

A large gas reservoir was discovered in previously unproductive dolostone in Longwangmiao Formation, central Sichuan Basin, China. Most of the reservoir porosity is developed in dolograins and dolopackstone. However, detailed internal fabrics of grains are mostly destroyed because of diagenesis, especially dolomitization. Therefore, grain types can only be distinguished based on outline of grains. In some cases, it is difficult to differentiate ooids from peloids as dolomitization has altered the preexisting wackestones, packstones, and grainstones. This study documents the quality of dolostone reservoirs using a combination of petrology, CL, SEM, fluid-inclusion microthermometry, and stable isotopes of core samples. Eight lithofacies are differentiated. (1) Ooid grain-dominated packstone and grainstone; (2) Intraclast grain-dominated packstone and grainstone; (3) Peloid wackestone and mud-dominated packstone; (4) intraclast wackestone and mud-dominated packstone; (5) bioclast wackestone; (6) Oncoid packstone; (7) mudstone; (8) sand-bearing or sandy wackestone and mudstone. Pore spaces can be divided into six types, which are inter-granular pore, inter-crystalline pore, intra-granular pore, vug, micropore and fracture. Vugs mainly occur in dolomited peloid/ooid grainstone, intraclast grain-dominated packstone and grainstone. Micropores are abundant in all dolomited lithofacies, especially in intra-crystalline. Three 3-order sequence are identified. (1) The lower sequence is characterized by meter-scaled cycles dominated by mudstone and wackestone, with a thin layer of ooid packstone and grainstone occurring at the top of each individual cycles. (2) The middle sequence displays thicker cycles, dominated by packstone and grainstone. (3) The upper sequence exhibits thicker cycles, and lithofacies are dominated by wackestone and mudstone with packstone at the top of cycles. Most of the reservoirs occur in the middle sequence of the cycle with lithofacies dolomited by dolograins and intraclast dolopackstone. Petrographic observations and geochemical data also show that five types of diagenesis can be identified. The types of diagenesis contain dolomitization, cementation, dissolution, Pyritization and stylolization. Early dolomitization and dissolution mainly contribute to reservoir genesis. The degree of dolomitization of original lithofacies also controls the quality of reservoir. Cementation, pyritization and stylolization reduce reservoir porosity.