Fault-Related Hydrothermal Dolomites in Cretaceous Platform Carbonates from the Karrantza Area (North Spain) : Outcrop Analogue for Dolomite Reservoir Characterisation

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Unequivocal evidence for late dolomitisation, associated with hydrothermal fluid circulation along faults is observed in many carbonate subsurface reservoirs. Hydrothermal activity is commonly accompagnied by several dissolution and cementation phases that modify reservoir properties. Consequently, in order to predict the geometry and distribution of petrophysically distinct units in the subsurface, it is essential to better understand the origin of these dolomite bodies.

Large dolomite bodies occurring in the Albian limestones of the Basque-Cantabrian Basin (Karrantza area, North Spain) have been studied as potential analogue. They are closely related to strike-slip faults and consist of ca. hundred meter wide and kilometre long irregular or more symetrical corridors concentrated along fault planes. Two main dolomite fabrics occur: dark fine anhedral dolomite and clear euhedral saddle dolomite, often associated to form rhythmites or zebra structures at outcrop and microscopic scales. These dolomites display a visual porosity network consisting of millimetric to centimetric vugs, often associated with zebra texture and lined by saddle dolomite and partially open microfractures. Locally, porosity can be occluded by late cementation phases. However, petrophysical analysis show an overall increase of porosity and permeability values compared to the tight host limestone.

Dolomite bodies related to hydrothermal activity have been interpreted to occur within the Upper Khuff Formation (Permo-Triasssic, Arabian Gulf). They are hosted within porous oolitic limestones and mainly consist of zebra structures associated with good vuggy and intercrystalline porosity (Phi-5 to 30%; K-10 to 3000mD). The resulting linked-bodies are laterally discontinuous and cross-cut stratigraphic units. Consequently, they can constitute good reservoir drains but they can also connect different reservoirs, with different pressure regimes favouring early water breakthrough.