# Late Authigenic Pyrite as an Indicator of Oil Entrapment: Case Histories from the Northwest Shelf, Australia

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Late authigenic pyrite cementation is common within sandstone reservoirs of the North West Shelf of Australia. It is well developed in the Early Cretaceous to Late Jurassic Angel Formation sandstone and in the Late Triassic Mungaroo Formation in wells in the Dampier Sub-basin of the Carnarvon Basin. It is also present in the Middle Jurassic Plover Formation sandstone in some wells in the Vulcan Sub-basin, and in the Middle Jurassic Laminaria Formation sandstone in wells on the western margin of the Flamingo Syncline in the northern Bonaparte Basin.

The pyrite-cemented sandstone in these wells developed by bacterial and/or thermochemical reduction of formation water sulphate and the resultant production of hydrogen sulphide at palaeo-oil/water contacts. Development of pyrite cementation in the sandstone is dependent on the presence of sulphate-rich formation water. In the Dampier Sub-basin, the present formation water is generally sulphate-rich and the presence of late authigenic pyrite cementation indicates sulphate-rich formation water during oil entrapment in the past. However, in the Bonaparte Basin the formation water sulphate content is quite variable ranging from moderate to very low. Accordingly, the distribution of pyrite-cemented sandstones is more scattered and in many cases indicates a change in formation water sulphate chemistry subsequent to oil entrapment.

The occurrence of late authigenic pyrite-cemented sandstone is therefore an invaluable indicator of palaeo-oil accumulations and of chemical evolution of formation water through time.