

Peristeritic plagioclase in North Sea hydrocarbon reservoir rocks: Implications for diagenesis, provenance and stratigraphic correlation

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ABSTRACT

Reservoir sandstones from well 30/16-7 in the Upper Jurassic Humber Group, UK North Sea, contain plagioclase feldspars with a range of chemical compositions, microtextures, and origins. The chemical composition of feldspar grains in samples from three different depths in the core ranges from ~0 to 18 mol% An. Two of the samples have a well-defined gap in the compositional range between ~An₄ and ~An₉. This gap reflects the absence of plagioclase feldspars with those compositions in the ultimate source area of the Humber Group sandstones. Examination of An-bearing feldspars on either side of the gap by TEM shows that they have lamellar and/or tweed exsolution microtextures that are characteristic of plagioclase feldspars having bulk compositions within the peristerite miscibility gap. This is the first time that peristerites have been found in a sedimentary rock, and they suggest a low-grade metamorphic provenance for the plagioclase population. Compositional gaps have been commonly observed in Ab-rich plagioclase feldspars from metamorphic rocks, although the precise reasons why feldspars do not form within the gap remain poorly understood. In addition to the An-bearing peristerites, 30/16-7 contains a varied suite of An-poor feldspars. The microtexture of some of these grains is consistent with a low-grade metamorphic provenance, whereas others are inferred to be diagenetic in origin and to have formed by albitization of detrital alkali or plagioclase feldspar. Stratigraphic differences in the presence and size of the compositional gap within the Humber Group suggests that plagioclase feldspars may be a powerful new tool for high-resolution stratigraphic correlation and may also be very sensitive indicators of changes in provenance.