

## **Postobduction Ooid Deformation in Mesozoic Limestone and Paleotemperature (Jabal Akhdar Dome, Oman Mountains)**

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### **ABSTRACT**

We studied Permo-Mesozoic ooids of the Jabal Akhdar Dome (JAD) to reveal its deformation and paleotemperature. The results were compared with smectite/illite crystallinity paleothermometers. Ooid strain was analyzed using the Flinn and Fry methods. Ooids from the mid-Jurassic Dhurma Fm. and the Lower Cret. Habshan Mbr. of the Shams Fm. of the northern flank of the JAD (Wadi Bani Kharous) display a combination of plastic deformation and pressure solution. Ooids are well suited for strain analyses as their original shape is spheric, setting them apart from conglomerate clasts. Since most ooids are calcitic, their shape is indicative of the transition between brittle and ductile conditions occurring between 150 and 250°C. Ooids show a strong component of flattening and small amounts of stretching within the z-x plane. These oolites are sandwiched between mylonitic limestone layers, which accommodated a larger amount of deformation. Mylonitization is due to down-dip extension (top-to-the NNE) of the northern flank of the JAD. Mylonitization was selective, it affected finer grained and less pure (i.e., slightly more marly) limestones characterized by lower shear strength with respect to the investigated oolitic limestone. Thus, total strain is greater in the mylonitic than in the oolitic limestones. The Fry method reveals similarly strain ellipse shapes for all the samples. Strain of these ooids implies temperatures  $\geq 150^\circ\text{C}$ . Ooids from the southern flank as well as the hinge zone of the JAD are not deformed, indicating a paleo-T  $\leq 150^\circ\text{C}$ . Ooid deformation is consistent with obtained paleo-T of 150-200°C in the northern and 120-150°C in the southern JAD. The lower temperatures towards the S are explained by reduced thickness of the allochthonous units. Deformation occurred after obduction of the Semail Ophiolite, most likely associated with gravity collapse (beginning during the upper Cret.) and exhumation of the JAD (mainly during the Oligocene/Miocene). This deformation is confirmed by the presence of a regional-scale extensional fault zone along the northern margins of the JAD and the Saih Hatat Dome, amounting to several kilometers of vertical displacement.