High-pressure hydrofracturing during deserpentinization

C.J. GARRIDO[1]* J.A. PADRÓN-NAVARTA[2], A. TOMMASI[3], V. LÓPEZ SÁNCHEZ-VIZCAÍNO[1,4], M.T. GÓMEZ-PUGNAIRE[1,2], A. JABALOY[5] AND A. VAUCHEZ[3]

[1]Instituto Andaluz de Ciencias de la Tierra (IACT), CSIC & UGR, Facultad de Ciencias. 18002 Granada, Spain
[2]Dep. Mineralogía y Petrología, Universidad de Granada, Facultad de Ciencias, 18002 Granada, Spain
[3]Géosciences Montpellier, CNRS & Université Montpellier 2, F-34095 Montpellier cedex5, France
[4]Dep. Geología, Universidad de Jaén, Escuela Pol. Sup., Alfonso X, 23700, Linares, Spain
[5]Departamento de Geodinámica, Universidad de Granada, 18002 Granada, Spain

Volatiles released from the dehydration reactions have to migrate across a relatively cold (<750°C), peridotite-layer above the incoming slab in subduction zones. To unravel the mechanisms allowing for this initial stage of fluid transport, we performed a detailed field and microstructural study of prograde peridotites in the Cerro del Almirez ultramafic massif (Betic Cordillera, Spain), produced during the HP antigorite breakdown (1.6-1.9 GPa & ~680°C) [1-2]. The metamorphic texture is partially obliterated by grain-size reduction zones (GSRZ), a few mm to meters wide, which form roughly planar conjugate structures characterized by (1) sharp, irregular shapes and abrupt terminations contacts with undeformed metaperidotite, (2) an important reduction of the olivine grain size (60-250 μm), and (3) decrease in the opx modal amount. Analysis of olivine crystal-preferred orientations in GSRZ shows similar patterns, but a higher dispersion than in neighboring metaperidotite. We propose that hydrofracturing is the main mechanism accounting for GSRZ supporting the substantial reduction of the opx modal content. Development of the GSRZ network was probably linked to the fluid release during atg-dehydration allowing for the formation of high permeability channelways for overpressured fluids. HP hydrofracturing may be an essential mechanism in the first stages of fluid flow through the coldest parts of top-slab mantle in subduction zones. The near-lithostatic pressure associated with this process produces transient low seismic velocities similar to those associated with episodic tremor and slip attenuation zones.

[1] Padrón-Navarta *et al*. (2010) *Contrib Mineral Petr* **159**, 25–42. [2] Garrido *et al*. (2005) *Geochem Geophys Geosyst*. **6**, doi, 10.1029/2004GC000791.

Monitoring of deep processes – The important part for understanding of a process of origin of hydrocarbons

NAKIP S. GATIATULLIN[1] AND IRINA.N. PLOTNIKOVA[2]*

[1]Tatarstan Exploration Department TatNeft Petroleum Company, Kazan
[2]Kazan State University, Kazan (*correspondence: irena-2005@rambler.ru,)

The problem of an origin of oil should dare on the basis of complex use of geological, geochemical and geophysical data. Undoubtedly process of synthesis of oil is connected with deep processes which can be shown in a sedimentary cover in the form of modern geodynamic activity. Today, due to the use of up-to-date and high-precision exploration techniques including space geology, detailed seismic studies, geophysical dynamics studies, ultradeep drilling, geodesic instrumental surveys, etc. it has been found that active endogenous processes take place in the areas that were previously considered to be geodynamically inert, such as ancient platforms or shields.

The half-century history of petroleum production in the eastern portion of the East-European Platform provides strong evidence that the location of oil fields is closely related to the crystalline basement structure primarily, as a factor that governs the formation of the sedimentary cover structure and that the fault-and-block tectonics plays a leading role in these processes. A network of geo-observatories, as a multipurpose structure, could provide data on the deep strata of the Earth's crust to be used both in fundamental studies and in applied research. The high-priority problems to be solved by geo-observatories are: 1). Petrographic, mineralogical and geochemical monitoring of the compositional evolution of loosely aggregated zones and their features. 2). Dynamic studies of physical fields in the deep strata of the Earth's crust by conducting systematic measurements of various parameters. 3). Conducting periodic seismoacoustic studies of the borehole environment. 4). Dynamic studies of the fluid regime in flow areas. 5). Analysis of seismic conditions in deep zones penetrated by boreholes. 6). Complex analysis and prediction of the hydrocarbon fluid regime in deep zones of the crystalline basement. Geo-observatories based on ultradeep wells have been created in many parts of the world including Russia (Kola Ultradeep Well SG-3), Germany (KTW ultradeep well) and Sweden (Silian well). Today, the Republic of Tatarstan offers adequate conditions for the development of regional geo-observatories.

A network of downhole geo-observatories can be created on the basis of the existing deep wells, among which the Novo-Yelkhovo-20009 well, that has reached a depth of 5881 m, plays the most important role. The creation of geo-observatories will require the use of the infrastructure in the Tatarstan's oil regions including power supply; traffic network; transport TRUNCATED.