

Geochronology of paleofluid migration: U-Th/He dating of epigenetic pyrite from the Bazhenov Formation, Western Siberia

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The Bazhenov Formation (Western Siberia) is renowned for being one of the world's largest oil source rocks. Pyrite, which can be found in various shapes and sizes within the organic-rich sediments, crystallised at different stages of sediment evolution [1].

Recently, pyrite has been identified as a promising U-Th/He geochronometer due to its ability to retain radiogenic He at the limits of pyrite thermal stability [2]. In this study, the U-Th/He method was applied to directly date epigenetic pyrite. Relatively large (> 200 μm) pyrite grains were manually extracted from the carbonate-rich rocks of the Bazhenov Formation within the Frolov mega-depression (sample depth 2705 m). The analysis was performed according to the methodology outlined by [3]. Measured mass fractions of U, Th and He were strongly (>10 times) above the blank values.

The U-Th/He analysis results (n=4) indicate that the epigenetic pyrite has an age range of 80–90 Ma, which is considerably younger than the Bazhenov Formation's deposition age (139–150 Ma). The disparity in age cannot be explained by He loss due to cooling and/or alpha-recoil effects. Thus, the U-Th/He age of pyrite provides evidence of paleofluid mobilization during the Upper Cretaceous period in this portion of the Western Siberian sedimentary basin. At present, the connection of this process to oil and gas migration is not clear.

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[2] Yakubovich, Gedz, Vikentyev, Kotov & Gorokhovskii (2019), *Petrology* 27, 59-78.

[3] Yakubovich, Vikentyev, Ivanova, Podolskaya, Sobolev, Tyukova & Kotov (2021) *Geosciences* 11(10):408.