

Research on Effective Helium-generated Source Rocks in Weihe Basin, Western China

ZHANG QIAO¹LI YUHONG²ZHANG WEN³ZHOU JUNLIN⁴

hotrock2012zq@163.com

L1763@tom.com

wenzhangcn@outlook.com

zjlcug@163.com

Helium is one of the noble gases. Its unique nature has made it widely applied for many high-tech fields. In China, its demand exceeds supply, and it depends on import in a long period. Weihe Basin was formed in Cenozoic, located on the south of Ordos Basin and north of Qinling Orogenic belt. Remarkable helium-enriched gases had been discovered in oil wells and geothermal wells in the Weihe Basin. The contents of helium gas varied from 0.19% to 9.23%, much higher than industrial grade (0.1%). Synthetic studies on the helium isotopic compositions of associated gases collected from wells suggested helium in the basin mainly generated from the decay of radioactive elements in the crust. Using the formula of Brown (2010), large numbers of granites from the southern margin of the Basin were likely to be the effective helium source rocks. EMPA results show that the occurrence of helium-generated elements (Th, U) in the granite was divided into two states: one in independent minerals, such as uranothorite, thorite, blomstrandite, the other in accessory minerals of rocks, like zircon, shpene, monazite, xenotime. Vacuum crush and melting experiments' results for granites in the north Qinling Orogenic belt by us told that more than 96% helium was reserved in the minerals above. According to the formula of radioactive decay, it was calculated that more than 80% helium was released from these rocks since they formed. Our detailed field surveys told us that granites composite from the southern margin of the Basin have distinctive contents of Th and U. Forming ages for rocks were main cause, and Indosinian rocks have offered vital contributions in Weihe Basin. Take Huashan complex pluton as an example, it was composed of Indosinian and Yanshanian rocks. Since their emplacement, the helium amounts by decay of Indosinian and Yanshanian rocks were about 1.6 million cubic meter and 0.4 million cubic meter, respectively. These amounts were merely about 3% of total amounts by the decay of helium-generated elements in Huashan plutons. If all helium hiding under the Weihe basin can be explored and exploited, the tension situation for domestic helium demand will be greatly relieved.

Brown A. A. 2010. Formation of High Helium Gases: A Guide for Explorationists. AAPG Convention, New Orleans, Louisiana, USA.