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冀北水泉沟岩体西段锆石U-Pb年代学及Hf同位素研究

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摘要：

冀北水泉沟碱性正长杂岩体位于华北克拉通北缘中段,主要岩性为正长岩、石英正长岩、碱性正长岩、角闪正长岩、角闪二长岩和碱长花岗岩等.为了避开后期热液蚀变作用的影响,作者采集了远离东坪-后沟金矿田的水泉沟岩体西段蚀变的角闪二长岩、角闪正长岩样品,并对这些代表性岩石进行了锆石U-Pb年代学和锆石Hf同位素研究.LA-ICP-MS锆石U-Pb年龄表明,角闪二长岩结晶年龄为372.7±2.5Ma,角闪正长岩结晶年龄为372.7±2.4Ma,二者年龄结果一致,表明水泉沟碱性杂岩体西段形成于晚泥盆世.角闪二长岩的锆石$\varepsilon_{Hf}(t)$ = -12.4~-8.9,两阶段Hf模式年龄为1.93~2.16Ga,平均2.05Ga.角闪正长岩的锆石$\varepsilon_{Hf}(t)$ = -13.2~-11.1,两阶段Hf模式年龄为2.07~2.21Ga,平均2.13Ga.考虑到两种岩石的模式年龄与华北基底变质岩的形成年龄相近,我们初步认为水泉沟碱性杂岩体西段角闪二长岩和角闪正长岩可能主要来源于富集岩石圈地幔部分熔融形成的镁铁质岩浆与古老的中下地壳变质岩部分熔融形成的长英质岩浆混合的结果.野外地质和地球化学数据表明,水泉沟碱性杂岩体形成于晚造山阶段的张性构造环境.

英文摘要：

The Shuiquangou alkaline syenitic complex in the northern Hebei Province is located in the northern margin of the North China craton. The dominant rock types include syenite, quartz syenite, alkli-syenite, hornblende syenite, hornblende monzonite and alkli-feldspar granite. To avoid the effect of the later-period hydrothermal alteraton, the authors took the not-altered hornblende monzonite and hornblende syenite as samples from the western segment of the Shuiquangou complex far from Dongping-Hougou gold deposit field. In this paper, we present a systematic study of zircon U-Pb geochronologic and Hf isotopes research for these two samples. LA-ICP-MS zircon U-Pb dating gives the emplacement age of 372.7±2.5Ma for the hornblende monzonite, and 372.7±2.4Ma for the hornblende syenite. The two samples have the same age in the range of allowable error, indicating that the western part of the complex formed during the Late Devonian. In-situ Hf analyses of zircons show that the zircons from the hornblende monzonite have $\varepsilon_{Hf}(t)$ values from -12.4 to -8.9 and Hf crustal model ages from 1.93Ga to 2.16Ga with an average of 2.05Ga, the zircons from the hornblende syenite have $\varepsilon_{Hf}(t)$ values of -13.2 to -11.1 and Hf crustal model ages of 2.07Ga to 2.21Ga with an average of 2.13Ga. All things considered, their model ages are similar to the formation ages of those of basement metamorphic rocks in the North China craton. Therefore, Hf isotopic compositions of zircons suggest that hornblende monzonite and hornblende synite from the western part of the complex indicate that the complex were produced by the magmatic mixing between mafic magma derived from enriched mantle and felsic magama derived from partical melting of the ancient metamorphic rocks of the middle-lower crust. Integrated geological and geochemical data suggest that the complexes are formed in extentional tectonic setting during the late orogenic episode.

关键词：碱性杂岩体 锆石U-Pb年龄 锆石Hf同位素 MASH模型 岩石成因 冀北水泉沟

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