Petrogenesis of the Syenite Granites in Kuluketage Block: Constraints from Petro-Geochemistry,Zircon U-Pb Dating and Hf Isotope

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Kuluketage block is the best area for Precambrian geology in Xinjiang, NW China. In this paper, we studied the petrology, geochemistry, zircon LA-ICPMS U-Pb chronology and zircon Hf isotope research of Daxigou syenite granite(DSG) which is located in Kuluketage. Zircons from the intrusions display oscillatory zoning and high Th/U ratios (0.16-2.11), implying their magmatic origin. Zircon U-Pb dating results of DSG indicate that they formed in Paleoproterozoic with the weighted 207Pb/206Pb average age of 1767±46Ma,which is coincidentally identical with its associated diorite age within the error range. Studies of petrogeochemistry suggest that DSG belong to medium-sodium and rich-potassium peraluminous calc-alkaline type, rich in Pb, La, Th and LILE, significant poor in HFSE(Gd, Nd, Ta). The chondrite-normalised REE pattern is slightly to the right form. The average ∑ REE is 56.57×10-6; HREE show moderate fractionation (LREE/HREE averaged 10.28, (La/Yb)N average of 13.04) N; average (La/Sm) N of syenite is 4.96, average (Gd/Yb) N is 1.67 and the δEu, δCe are not obvious. Their initial Hf isotope ratios and Hf two-stage model ages range from-7.74 to -4.02 and 2.74Ga to 2.67Ga, respectively. Taken together, it is suggested that DSG is the typical S-type granite and its primary magma could be mainly derived from partial melting of the Neoarchean crust and mainly formed in the syn-collision arc environment, which recoded the tectonic-magma activities response of Tarim refers to the amalgamation of the supercontinent Columbia.

Copper-mediated oxidation of hydroquinone under conditions typical of natural saline waters

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Copper (Cu) is an essential transition metal that is involved in a variety of photoreactions and physiological processes. The redox chemistry between cuprous copper (Cu(I)) and cupric copper (Cu(II)) in the upper water column plays a significant role in its speciation, transport and bioavailability [1]. As electron transfer mediators, quinone moieties in natural organic matter (NOM) play important roles in essential biogeochemical processes [2-3]. In this study, detailed kinetic model has been developed to describe the oxidation of 1,4-hydroquinone (H_2Q) by Cu(II) in the presence O_2 in 0.7 M NaCl solution at pH range 6.5 – 8.0. Cu(II) catalyzed the overall oxidation of H_2Q in a strongly pH dependent manner with concomitant formation of benzoquinone and H_2O_2.

The kinetic model indicated the mono-anion HQ^- is the active species to reduce Cu(II) with an intrinsic rate constant of 5.0×10^7 $M^{-1} \cdot s^{-1}$. While the semiquinone radical ($SQ^{\bullet -}$) generated from one-electron oxidation of hydroquinone or one-electron reduction of benzoquinone acts as a chain propagating species, the presence of O_2 in the system is also essential in terms of supplying Cu(II) by continuously oxidizing Cu(I) and rapidly removing $SQ^{\bullet -}$ to generate $O_2^{\bullet -}$. The development of the kinetic model should assist in understanding and predicting the factors controlling copper transformation, speciation, bioavailability and toxicity in aquatic systems.

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