Origin of 2.49-2.45Ga dioritic-granitic gneisses in the Daqingshan area, North China Craton

OUYANG DONGJIAN[1 2] , GUO JINGHUI[1 2]

[1]State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences(CAS), Beijing, China (ouyangdongjian15@mails.ucas.ac.cn)

[2]College of Earth Science, The Graduate School, Chinese Academy of Sciences, China (jhguo@mail.iggcas.ac.cn)

A 2.49-2.45Ga dioritic-granitic rock association occurred in the Daqingshan area, the southern periphery of the Yinshan Block, the North China Craton (NCC). Four types of rocks have been identified based on their geochemistry indexes, they are Na-rich diorites (NDG), K-rich diorites (KDG), S-type granites and A-type granites respectively. (1) The ca.2.47Ga NDG show adakite-like affinity with high Na2O/K2O, Sr/Y, La/Yb values, LILE enrichment, and positive εHf(t) and εNd(t) values, indicating a partial melting product of a juvenile lower crust with garnet in residue. (2) The ca.2.49Ga KDG are characterized by higher K2O/Na2O ratios, MgO, Cr, Ni contents, lower Sr/Y and less fractionated REE than the NDG, resembling the sanukitoids. However, incontrast with metasomatic mantle signature of most sanukitoids, the negative εHf(t) values with model ages of >3.0Ga imply that this KDG were derived from older continental crust. (3) The ca.2.49Ga S-type granites are slightly peraluminous, showing high SiO2, LILE, LREE, low CaO and Y contents with extremely high Sr/Y and La/Yb values. Their striking negative εHf(t) isotopes and high $\delta^{18}O$ values suggest that they were procuded by reworking of pre-existing metasedimentary rocks at high pressures. (4) The 2.45Ga A_2-type granites exhibit elevated TiO2, P2O5, HFSE and Y contents with high Fe/(Mg+Fe) (0.90-0.72), 10000Ga/Al (2.46-3.02) and Zr+Y+Ce+Nb (439-853ppm) values, weak REE fractionation and strong negative Eu anomaly. The uniform positive εHf(t) and εNd(t) isotopes suggest that they were originated from dehydration melting of homogeneous intermediate rocks at low pressure and high temperature.

Integrating the data present above and other published materials, the dioritic-granitic rocks in the Daqingshan area were likely to be originated by crustal melting from deep to shallow level during 2.49-2.45Ga. They are significantly different with >2.5Ga TTG dominated rock associations widespread in the NCC. We intend to consider this temporal change of magma compositions correspond to the tectonic transition from subduction-accretionary collision to extension. The occurrence of the A-type granites heralds the final craton stabilization of the NCC at ca. 2.45Ga.