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Geochemical and Sr-Nd isotopic characteristics of tonalite-trondhjemite-granodiorite (TTG) rocks in southwestern Gyeonggi Massif, Korea

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Neoproterozoic (ca. 820 Ma) granitoids intruding Early Proterozoic basement gneiss occur in southwestern Gyeonggi Massif, Korea. These granitoids are classified primarily into tonalite and granodiorite, and consist of hornblende, biotite, plagioclase, titanite and quartz with or without minor K-feldspar. These rocks belong to volcanic arc granite or syn-collisional granite based on Nb vs. Y and Rb vs. Y+Nb discrimination diagrams. Major, trace and rare earth element (REE) chemistries characterized by high Al_2O_3 (12.9 − 17.2 wt%), low K_2O/Na_2O (0.21 − 0.99), and low Y and Yb contents (2.32 − 0.26 ppm and 0.24 − 1.85 ppm, respectively) show tonalite-trondhjemite-granodiorite (TTG) signatures. These TTG rocks might leave behind residual amphibole and garnet in the source, because they are depleted in middle to heavy REEs, and high Sr/Y (33 − 318), La/Yb (8 − 57) and Y/Yb (9 − 12). The εNd(t) values of six samples range from +3.6 to − 2.5 and the initial $^{87}Sr/^{86}Sr$ ratios are in the range of 0.7028 − 0.7069. These isotopic characteristics indicate significant contribution of juvenile mantle material in the formation of the TTG rocks. All the above geochemical and isotopic features, especially light REE enrichment, suggest that the TTG granitoids were generated in an arc environment by partial melting of subducted oceanic crust at pressures high enough to stabilize garnet and amphibolite. Similar occurrences of Neoproterozoic granitoids in the South China Block favor the correlation between the Gyeonggi Massif and South China Block.