Metamorphism and *P-T* evolution of pelitic high pressure granulite in Chicheng, northern part of the Paleoproterozoic Trans-North China Orogen

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Chicheng, northern part of the Trans-North China Orogen developed large scale high pressure granulites of volcanic-sedimentary sequence. Detailed mapping of Womakeng, Chicheng discovered that high pressure granulite terrane is mainly consist of interlayers of 30% mafic granulites, 40% intermediate granulites and 30% felsic granulites, as well as minor pelitic granulites, and they may keep the composite character of volcanic-sedimentary protolith. Mafic granulites record typical PT path of high pressure metamorphism in the high pressure granulite terrane, and this study focus on pelitic granulites further. Three pelitic granulite belts of ca.20-50 cm thick have been recognized, and they have typical high pressure granulite facies' mineral assemblage of kyanite + perthite. Detailed petrology study recognized three metamorphic stages of mineral assemblages. The early prograde metamorphic stage (M1) has mineral assemblages of garnet+biotite+potassium feldspar+plagioclase +quartz. The peak metamorphic mineral assemblage (M2) consists of garnet Ⅱ, kyanite, antiperthite predominantly with minor plagioclase and quartz. The post-peak (M3) stage's mineral assemblage is garnets Ⅲ+biotite+ potassium feldspar+

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plagioclase+quartz. Phase equilibria modelling by THERMOCALC program combined with thermobarometric calculations yielded obvious difference between PT condition of peak pressure (M2a) and peak temperature (M2b), and they are 880 ℃, 16 kbar and 950 ℃, 15 kbar respectively, which indicate distinct thermal relaxation process. Petrology observation of pelitic granulites found three kinds of coronas of surrounding kyanite generate, and from inside to out they are small garnets, plagioclases and potassium feldspars, and simultaneously biotites break down during thermal relaxation. While biotites formed again and plagioclases exsolve potassium feldspars during late stage's (M2b-M3), and sillimanites do not appear, which suggests decompression and cooling synchronously. Comparing pelitic granulites to mafic granulites, pelitic granulites have higher temperature and they have very similar PT path. Both of them record thermal relaxion processs, as well as decompression and cooling process after peak temperature. The drastic cooling from M2b to M3 should be particularly mentioned because it leads to the PT paths of pelitic and mafic granulites avoiding access to low pressure and high temperature area. As a result the former lack sillimanite while the latter lack orthopyroxene, which becomes a significant sign of the difference between granulites of Womakeng and other granulites in the Trans-North China Orogen. It may indicate quick exhumation. The monazite and zircon SIMS U–Pb dating together reveals that peak metamorphism of Chicheng pelitic granulites probably occurred at ca.1910 Ma. This study suggests Chicheng experiented subduction, collision and quick tectonic uplift, providing reliable metamorphic record for tectonic collision process of the paleoproterozoic Trans-North China Orogen.