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# Deformation-metamorphic structure, texture and geothermometry of graphitic carbon-bearing rocks within Ailaoshan metamorphic complex, SE Asian China

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Graphitic carbon-bearing rocks generally occur in low- to high-grade metamorphic rocks. In many brittle faults, graphite is often associated with gouge or low-grade metamorphic rocks while in ductile shear zone, graphitic carbon is most commonly seen in marble, schist or gneiss. It is considered that the crystallinity of carbonaceous material (CM) in the rock will change through mechanical and chemical mechanisms controlled mainly by thermal metamorphism in the faulting process, gradually transformed from an amorphous into an ordered crystalline structure, a process, which is called graphitization. This ordering process is irreversible and the resulting structure is not affected by late retrograde metamorphism. Consequently, graphitization is believed to be a reliable indicator of peak temperature conditions of a metamorphic rock. Besides, some previous laboratory experiments show that graphite formed in the rock can significantly affect the mechanical properties of the fault during the process of faulting, which can effectively cause reaction weakening and strain localization. On the basis of previous research results and detailed field geological observations, the graphitic carbon-bearing rocks in the southeastern part of the Ailaoshan complex in the Cenozoic Ailaoshan-Red River (ASRR) strike-slip fault zone are studied in this paper. We selected samples from the area between the shear zone and nearby hingingwall, with graphitic carbon material content of no more than 10 percent through major element analysis. The technical methods of optical microscope (OM), scanning electron microscope (SEM), electron backscatter diffraction (EBSD) and Raman spectroscopy are mainly used to comprehensively analyze the deformation macro- and micro-structure of graphite-bearing rocks and minerals, the graphite Raman temperature, the mineral lattice preferred orientation (LPO) and its deformation-metamorphic environment. Graphite Raman spectroscopy geothermometer shows that the Raman peak temperature of graphite-bearing rocks in the study area is 530-460°C. Graphite and matrix quartz and plagioclase have obvious similar lattice preferred orientation, and graphite and quartz show strong slip system in the direction of (0001) <a>. The development of fine-grained graphite, feldspar and quartz together play an important role in rheological weakening of the grain plastic deformation of the whole rock. Consequently, we argue that the presence of graphitic carbon controls the location of ductile shear zones, and shear processes are supported by other rock-constituting minerals.