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Supplemental Material

Table S1. List of studied samples from the Qiyugou Au deposit, Leimengou Mo deposit and Huashan barren pluton.

Table S2. Petrography and microthermometry data of fluid inclusion assemblages.

Table S3. Average elemental concentrations ($\mu\text{g/g}$) of fluid inclusion assemblages.

Table S1 List of studied samples from the Qiyugou Au deposit, Leimengou Mo deposit and Huashan barren pluton.

Location	Sample	Brief description	P	M	LA
Qiyugou	19Q-01	Fine-grained PG, weak phyllic alteration, 15 m (from the southern margin) at 220 m level	√		
	19Q-02	Fine-grained PG, crosscut by pyrite vein which is poor in quartz, 40 m at 220 m level	√		
	19Q-03	Fine-grained PG with disseminated pyrite, phyllic alteration, 80 m at 220 m level	√		
	19Q-04	Fine-grained PG with disseminated pyrite, 110 m at 220 m level	√		
	19Q-05	Fine-grained PG, thin vein with abundant pyrite and minor quartz, 140 m at 220 m level	√		
	19Q-06	Pyrite-quartz veins cut the potassic altered PG, the veins have open cavities, 170 m at 220 m level	√		
	19Q-07	Strongly potassic alteration and silicification, pyrite occurs along the boundary or in the vein, 175 m at 220 m level	√		
	19Q-08	Milky pyrite + quartz vein that crosscuts the pinkish PG, disseminated pyrite is abundant, 190 m at 220 m level	√	√	√
	19Q-09	Massive ore with weak potassic alteration, crosscut by pyrite-quartz vein, 195 m at 220 m level	√		
	19Q-10	Pyrite + quartz vein in PG, abundant medium-grained pyrite as aggregates, 180 m at 220 m level	√		
	19Q-11	Massive PG with pinkish color and disseminated pyrite, strongly potassic altered, 180 m at 220 m level	√		
	19Q-12	Massive ore with potassic-altered PG and pyrite + quartz vein, 200m at 220 m level	√		
	QYG-10	Fine-grained PG, pyrite is more abundant in the phyllic-altered domain, at 280 level	√		
	QYG-11	Potassic-altered PG with disseminated pyrite, at 280 m level	√	√	√
	QYG-12	Pyrite + quartz vein crosscut quartz + pyrite + molybdenite vein, host rock is PG, at 280 m level	√	√	√
	QYG-13	Thin vein of quartz + pyrite + molybdenite that cuts the fine-grained PG, at 280 m level	√	√	√
	QYG-14	Milky quartz vein that cuts potassic-altered PG, open cavities in the vein, at 280 m level	√		
	QYG-15	Milky quartz + pyrite vein that cuts the PG, disseminated pyrite in the vein and in the PG, at 280 m level	√		
	QYG-16	Massive ore with strong potassic alteration, PG crosscut by pyrite-quartz vein, at 280 m level	√		
Leimengou	QYG-17	Milky quartz with open cavity that cuts fine-grained PG, at 280 m level	√		
	QYG-18	Milky quartz with open cavity in host rock PG, at 280 m level	√		
	QYG-19	Coarse-grained pyrite + quartz vein that cuts pinkish PG, pyrite occurs in aggregates, at 280 m	√		
	LMG-01	Quartz + molybdenite + pyrite ± chalcopyrite veinlets, crosscut the potassic-altered GP	√	√	√
	LMG-02	Milky quartz + pyrite ± molybdenite veins that crosscut GP, minor molybdenite distributed along the vein margin	√		

	LMG-03	Milky quartz + pyrite \pm molybdenite veins that crosscut GP, abundant molybdenite in the vein	√		
	LMG-04	Coarse-grained fluorite + calcite + quartz vein with open cavity	√		
	LMG-05	Weakly-altered GP with disseminated pyrite, crosscut by K-feldspar + quartz + molybdenite vein	√		
	LMG-06	Milky quartz vein with minor pyrite in the vein and molybdenite along the margin that crosscuts K-altered GP	√		
	LMG-07	Quartz + pyrite vein and quartz + molybdenite + pyrite vein that crosscut each other, host rock is GP	√		
	LMG-08	Quartz + pyrite vein crosscut by quartz + molybdenite + pyrite vein, the host GP contains disseminated pyrite	√		
	LMG-09	Strongly potassic-altered GP, crosscut by quartz + pyrite vein which contains no molybdenite	√		
	LMG-10	K-feldspar + quartz + molybdenite vein that crosscuts the GP which contains disseminated pyrite	√	√	√
	LMG-12	Barren GP, coarse K-feldspar constitutes the major phenocryst, no visible sulfide in hand-specimen	√		
	LMG-13	Barren GP, coarse K-feldspar constitutes the major phenocryst, no visible sulfide in hand-specimen	√		
	LMG-14	Barren GP with abundant disseminated pyrite	√		
	LMG-15	Quartz + molybdenite + pyrite vein that crosscuts the PG, the core of the vein is dominantly barren quartz, molybdenite and pyrite occur along the margin	√		
	LMG-16	Quartz + molybdenite + pyrite vein that crosscuts the PG with open cavity, molybdenite occurs along the margin	√		
	LMG-17	Massive potassic-altered GP with disseminated pyrite, crosscut by thin quartz + molybdenite vein	√		
	LMG-18	Strongly potassic-altered GP with open cavity, crosscut by thin quartz + molybdenite vein	√		
	LMG-19	Massive GP with open cavity, molybdenite occurs as disseminated aggregates in the porphyry	√		
	LMG-20	Quartz + fluorite (light blue and colorless) vein that crosscuts the GP	√	√	√
Huashan	19HS-01	Porphyritic biotite monzonite, phenocrysts: K-feldspar, plagioclase, quartz, biotite	√		
	19HS-02	Porphyritic monzonitic granite, phenocrysts: K-feldspar, plagioclase, quartz	√	√	
	HS-01	Porphyritic biotite monzonite, phenocrysts: K-feldspar, plagioclase, quartz, biotite	√	√	
	HS-02	Porphyritic biotite monzonite, phenocrysts: K-feldspar, plagioclase, quartz, biotite	√	√	√
	JSM-01	Porphyritic biotite granite, phenocrysts: plagioclase, quartz, biotite	√		
	JSM-02	Porphyritic biotite granite, phenocrysts: plagioclase, quartz, biotite	√	√	√

Abbreviations: PG, porphyritic granite; GP, granite porphyry; P, petrography; M, Microthermometry; LA, laser ablation-inductively coupled plasma-mass spectrometry.