Figure S1. Mechanism diagram of ablation cell (1—the ablation cell; 2—calcium fluoride window; 3—the lid made of PEEK; 4—the thermally conductive copper plate; 5—peltier element; 6—the water-cooled platform; 7—baseplate; 8—the laser).
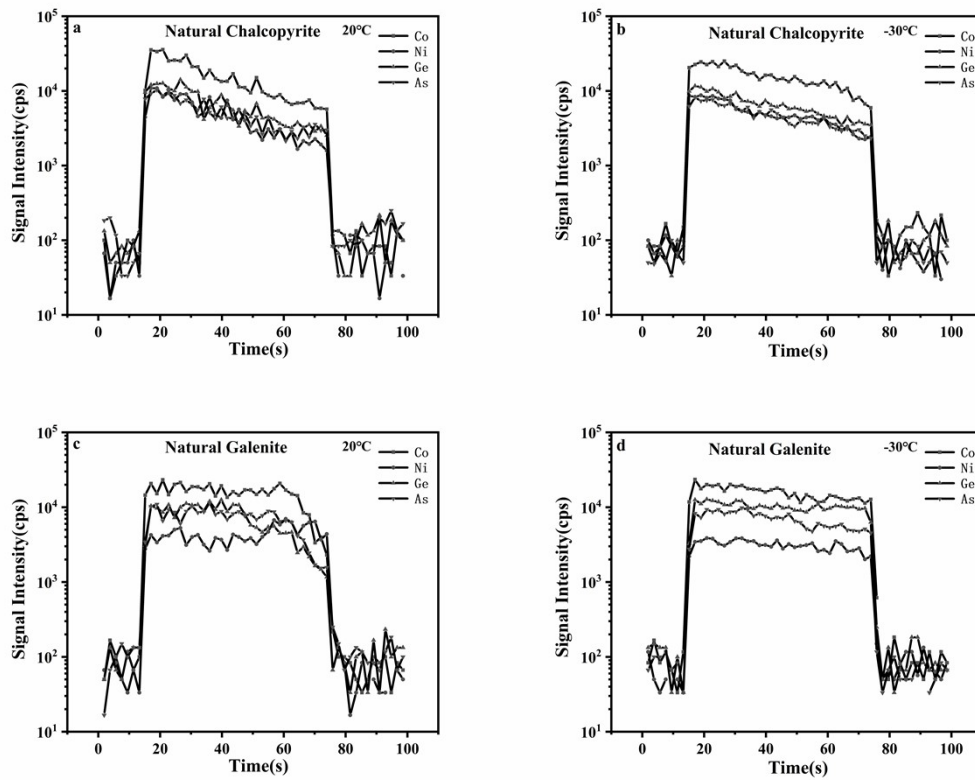
Figure S2. The time-resolved signals at various ablation temperatures (a-natural chalcopyrite at 20 ℃, b-natural chalcopyrite at -30 ℃, c-natural galenite at 20 ℃, d-natural galenite at -30 ℃).
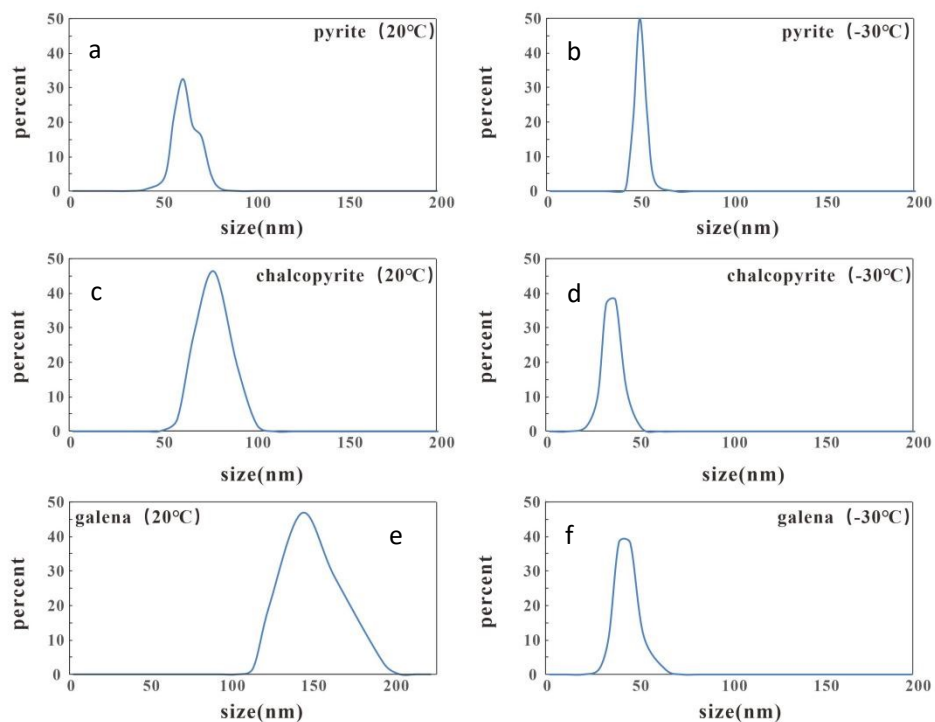
Figure S3. The ablated aerosol particle distribution following laser ablation of three natural sulfides at varying temperatures (a-pyrite crystal at 20 ℃, b-pyrite crystal at -30 ℃, c-chalcopyrite crystal at 20 ℃, d-chalcopyrite crystal at -30 ℃, e-galena crystal at 20 ℃, f-galena crystal at -30 ℃. Ablation conditions: laser energy density is 6 J/cm², ablation time is 60 seconds).