Magmatic Oxidation State of Baogutu Porphyry Copper Deposit, Xinjiang, China: Implication for Porphyry Copper Mineralization

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The Baogutu porphyry copper deposit is a newly discovered middle-size porphyry copper deposit in west Junggar, Xinjiang, China[1-2]. Several mineralized intrusions (numbered I to V) exposed in the mining area. The petrology of these intrusive bodies is mainly granodiorite, quartz diorite and diorite, with equigranular or porphyritic texture[3-4]. Zircons from these intrusions have low Ce^{4+}/Ce^{3+} ratios (average 67.0±39.5, n=54) and Eu/Eu^{*} ratios (average 0.40 ±0.09, n=54), plotting in the lower section of the variation range of typical porphyry copper deposits worldwide[5-8]. Magnetite-ilmenite mineral pairs, intergrowths with straight boundaries and without exsolution textures, record an average ΔFMQ of 2.72 ± 0.70 (n=16). Fresh samples show intermediate whole-rock Fe^{3+}/Fe^{2+} ratios (average 0.71±0.40, n=12), plotting near the boundary of "magnetite series" and "ilmenite series". The corresponding oxidation state are mainly "moderately oxidized". Amphiboles from Baogutu intrusions yield ΔFMQ of 2.5 ± 0.5 (n=58), which is in agreement with the magnetite-ilmenite mineral pair and whole-rock Fe^{3+}/Fe^{2+} ratios estimate. Considering all these mineralogical and geochemical parameters, it turns out that the ore-forming magma of Baogutu porphyry copper deposit is oxidized, with ΔFMQ > 2. Fluids exsolved from these magmas are crucial to the formation of porphyry copper deposits.

[1] Zhang et al. (2006) *Geology China* **33**, 1354-1360. [2] Shen et al. (2009) *Acta Petrologica Sinica* **25**, 777-792. [3] Wei et al. (2015) *Acta Petrologica Sinica* **31**, 143-160. [4] Cao et al. (2014) *Ore Geology Reviews* **56**, 159-180. [5] Burnham et al. (2012). *Geochimica et Cosmochimica Acta* **95**, 196-212. [6] Munoz et al. (2012) *Journal of Petrology* **53**, 091-1122. [7] Shen et al. (2015) *Economic Geology* **110**, 1861-1878. [8] Wang et al. (2014) *Economic Geology* **109**, 1943-1965.