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The Muruntau gold deposit (Uzbekistan) - A unique ancient hydrothermal system in the southern Tien Shan

Kempe, U.¹, Graupner, T.², Seltmann, R.³, de Boorder, H.⁴, Dolgoplova, A.³, Zeylmans van Emmichoven, M.⁴

¹Institut für Mineralogie, TU Bergakademie Freiberg, Brennhausgasse 14, 09596 Freiberg, Germany

²Federal Institute for Geosciences and Natural Resources (BGR), Stilleweg 2, 30655 Hannover, Germany

³Centre for Russian and Central EurAsian Mineral Studies (CERCAMS), Department of Earth Sciences, Natural History Museum, Cromwell Road, London SW7 5BD, UK

⁴Faculty of Geosciences, Utrecht University, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands

The Muruntau gold deposit in the Central Kyzylkum, Uzbekistan is one of the largest single gold deposits worldwide. Data from the literature are reviewed with the aim to (1) integrate the present knowledge on this unique deposit from studies in the Russian and English literature; (2) show the considerable progress made in the understanding of the genesis of the Muruntau deposit during the past decades; and (3) point to problems still open for future research. Deposit formation occurred through a multi-stage process involving sedimentation, regional metamorphism including thrusting, magmatism with formation of hornfels aureoles, and several stages of hydrothermal activity. According to recent knowledge, synsedimentary or solely metamorphic formation of gold mineralization seems unlikely. The role of granite magmatism that occurred roughly within the same time interval as the main hydrothermal gold precipitation remains uncertain. There are no signs of significant interaction between the magma(s) and the hydrothermal system(s). On the other hand, there was an intense, high-temperature (>400 °C) fluid and wall rock interaction resulting in the formation of gold-bearing, cone-like stockworks with veins, veinlets, and gold-bearing metasomatites. Several chemical and isotope indicators hint at the involvement of lower-crustal or mantle-related sources, as well as of surface waters in ore formation. Deposit formation through brecciation involving explosion, hydrothermal, or tectonic breccias might explain these data.

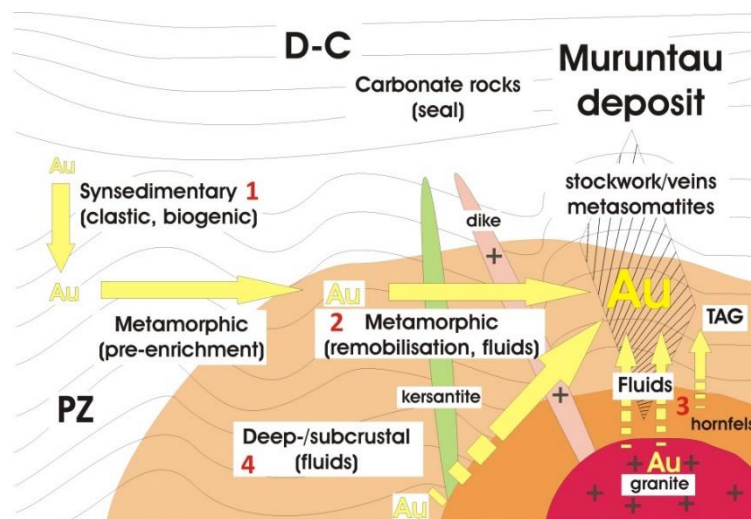


Figure 1: Sketch illustrating most popular genetic concepts for the formation of the giant Muruntau Au deposit (from [1]): (1): Synsedimentary deposition of clastic or dissolved Au with sorption on biogenic carbon; subsequent pre-enrichment of Au during regional metamorphism; (2) Remobilization & precipitation of Au in the vein system during tectonic-metamorphic activity; (3) Precipitation of Au in the vein system and metasomatites by fluids generated by the granitoid intrusions or driven by the thermal aureole of such intrusions; (4) Au supply into the vein system by fluids of deep- or subcrustal origin possibly related to mantle magmatism.

References:

[1] Kempe U et al. (2016) Geoscience Frontiers <http://dx.doi.org/10.1016/j.gsf.2015.09.005>

