GEOLOGICAL CONTROLS ON THE GENESIS AND GEOMETRY OF THE GIANT ASHANTI AU DEPOSIT

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The Ashanti Gold Mine is one of the largest operating gold mines in the world, with over 900 tonnes of Au in past production and reserves. An extended program of geological mapping including all surface and underground workings was undertaken to identify the geological controls on Au mineralization within this giant deposit. The deposit is hosted by Birimian metasedimentary sequences, interlayered volcanic rocks and felsic/granitoid intrusives. All host rocks have undergone several phases of deformation including: (1) development of early layer parallel fabric, (2) regional-scale E-verging thrusting and formation of carbonaceous shear zones, (3) 0.1-1 km-scale, E-trending, NE-plunging kink folding, (4) brittle-ductile sinistral strike-slip faulting, and (5) minor brittle faulting after Au mineralization. Gold mineralization occurs as free Au within quartz veins and refractory Au bound within arsenopyrite in alteration zones formed in and around shear zones. Both styles of mineralisation developed during a single protracted mineralizing event synchronous with sinistral strike-slip faulting at ca. 2090Ma. Gold mineralization is restricted to sinistral strike-slip faults and those earlier thrust fault segments reactivated during sinistral shear. Other thrust fault segments that were inactive during sinistral shear are unmineralized. Oreshoots are located in dilatant sites where mineralizing shear zones step left across D3 kink folds, and in pressure shadows associated with volcanic units and felsic/granitoid intrusions within the sedimentary sequence. Integration of the new understanding of structural controls combined with available geochemistry, geochronology and fluid inclusion data establishes the Ashanti mine as a typical mesothermal Au deposit. The identification of the specific structural controls on gold mineralization at Ashanti has led to the successful delineation of further resources in geologically analogous sites.