

Comprehensive deep geological-geophysical studies and identification of new world-class resources, northwestern Jiaodong gold province, China

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Jiaodong is the largest gold producing area in China, but after several decades of operation, most of the mines are facing the crisis of limited gold resources. Analysis of the metallogenic characteristics of the ores and further exploration for additional gold resources at depth are the greatest challenges for the future. Therefore, deep exploration and a comprehensive research project focused on the study of deep geological features and associated resource prediction in the Jiaodong gold province are being carried out by the Shandong Gold Group.

The gold deposits in the northwestern part of the Jiaodong Peninsula are strictly controlled by the regional NNE- to NE-trending faults. The dip of these faults changes from steep to gentle as depth increases within existing underground mining operations. The most enriched parts of the gold deposits/orebodies consistently occur at the locations where the dip angles of the ore-controlling faults change. Furthermore, additional ore zones are typically found below this first high-grade ore shoot. A NW-trending MT depth sounding transect, which crosses both the Sanshandao and Jiaojia highly mineralized faults, clearly shows the changes in fault orientations. Both of these faults exhibit slight but notable fluctuations along their strike and dip directions. They dip, however, in opposite directions and converge at ~5.5 km depth.

Multiple layers of thick (>100 m) gold orebodies at a depth of 1600-1900 m have been exposed by a series of drill holes to ~2000 m along the fault systems. Furthermore, three deeper holes, ZK96-5 (4006.2 m), ZK96-6 (2755.7 m), and ZK112-1 (2738.8 m), have revealed a ~22.5-m-thick orebody with an average grade of 3.9 g/t at 2600 m, as well as some stockworks of gold-bearing quartz-pyrite veins at 3500 m in the Xiling mine area of the Sanshandao deposit. These new findings have verified previous predictions of ores continuing to greater depth along the fault systems. Meanwhile, estimates of temperature, pressure, and composition of the ore-forming fluids from fluid inclusion studies, as well as geophysical logging at different depths within the super-deep drill holes, have been conducted. Resulting data indicate that the nature of the gold-depositing fluids was almost the same over the entire 4000 m depth and several geophysical anomalies identified new deep zones of mineralization that support the likelihood of future exploration success at greater depths in Jiaodong.

Based on the comprehensive geological and geophysical studies, ~800 tons of gold at depth have been newly proven along the middle to southern parts of the Sanshandao fault system. Further predicted gold resources for this belt of deposits along the fault is >1000 tons. Thus, our recent exploration program suggests the Sanshandao fault system must be considered as one of the world's great gold ore-hosting structures with some of the most extensive down-dip ore systems ever defined.