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The Syama and Tabakoroni goldfields, Mali

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ABSTRACT

Gold deposits in the Syama and Tabakoroni goldfields in southern Mali occur along a north-northeast trending mineralised litho-structural corridor that trends for approximately 40 km. The deposits are interpreted to have formed during a craton-wide metallogenic event during the Eburnean orogeny. In the Syama goldfield, gold mineralisation in 9 deposits is hosted in the hanging-wall of the Syama-Bananso Shear Zone in basalt, greywacke, argillite, lamprophyre, and black shale. Gold is currently mined primarily from the oxidised-weathered zone of the ore bodies. In the Syama deposit, mineralisation hosted in altered basalt is associated with an intense ankerite–quartz–pyrite stockwork vein systems, whereas disseminated style mineralisation is also present in greywackes. In contrast, the Tellem deposit is hosted in quartz–porphyry rocks.

In the Tabakoroni goldfield, gold mineralisation is hosted in quartz veins in tertiary splay shears of the Syama-Bananso Shear Zone. The Tabakoroni orebody is associated with quartz, carbonate and graphite (stylolite) veins, with pyrite and lesser amounts of arsenopyrite. There are four main styles of gold mineralisation including silica-sulphide lodes in carbonaceous fault zones, stylolitic quartz reefs in fault zones, quartz–Fe–carbonate–sulphide lodes in mafic volcanics, and quartz–sulphide stockwork veins in silicified sediments and porphyry dykes. The several deposit styles in the goldfield thus present a number of potential exploration targets spatially associated with the regional Syama-Bananso Shear Zone and generally classified as orogenic shear-hosted gold deposits.

1. Introduction

The Syama goldfield in southeastern Mali (Fig. 1) includes the Syama gold mine and several associated satellite gold deposits including the Syama extension, Alpha, BA01, Tellem, Basso, Quartz Vein Hill, Chert Ridge and A21 deposits (Fig. 2; Table 1). The Tabakoroni goldfield is the southern extension of the main Syama litho-structural corridor (Figs. 1, 3). The goldfields are situated approximately 280 km southeast of Bamako and 70 km south-southwest the regional capital of Sikasso. They are hosted in a north-northeast trending, steeply west-dipping Bagoe volcano-sedimentary belt (after Kušnir, 1999), which is the northwestern extension of the Bondiali-Diaoula belt in Cote d'Ivoire (Bessoles, 1977). The Bagoe belt is crosscut by the Syama-Bananaso Shear Zone in the Syama and Tabakorni goldfields, and marks the regional boundary between the Kadiana-Madinani terrane to the west and the Kadiolo terrane to the east (Fig. 1).

In the Syama goldfield, gold is primarily mined from the oxidised-weathered zone, but hard rock sulphide mineralisation occurs at depth. The total mineral resource reported for the Syama goldfield is 38.27 Mt including 13.28 Mt at 2.89 g/t Au for the Syama main open deposit for 1237 contained koz Au, 10.69 Mt at 2.34 g/t Au for the satellite deposits for 805 contained koz Au, and 14.3 Mt at 2.4 g/t Au for the Syama underground deposits for 1103 contained koz Au (Resolute Mining Ltd, 2014; Table 1).

Gold mineralisation is hosted in the hanging-wall of the Syama-Bananaso Shear Zone (Figs. 1, 2a, 2b) in tholeiitic basalt (plagioclase pyroxene), lithic (grey)wacke, argillite, lamprophyre and black shale. Ankerite, quartz, sulphide and albite veinlets are associated with gold mineralisation, and zones of massive fine-grained silica and pyrite correlate with higher gold grade zones.

In comparison, the Tabakoroni goldfield is part of the Finkolo Exploitation Permit, located in the district of Kadiolo, immediately adjacent to the international border of Mali with Cote d'Ivoire, approximately 40 km west of Kadiolo and 15 km south of Fourou (Table 2). The total mineral resource reported by Resolute Mining Limited (December 2013) for the Tabakoroni goldfield is 9.96 Mt @ 2.59 g/t Au for 830 contained koz Au (Table 2). Gold mineralisation is hosted Tabakoroni shear zone which is a tertiary play shear off the Syama-Bananaso Shear Zone. Gold mineralisation occurs in quartz veins and intense silica alteration, with varying amounts of pyrite, carbonate and sericite. Mineralised quartz veins range from a few centimetres to metres in width.

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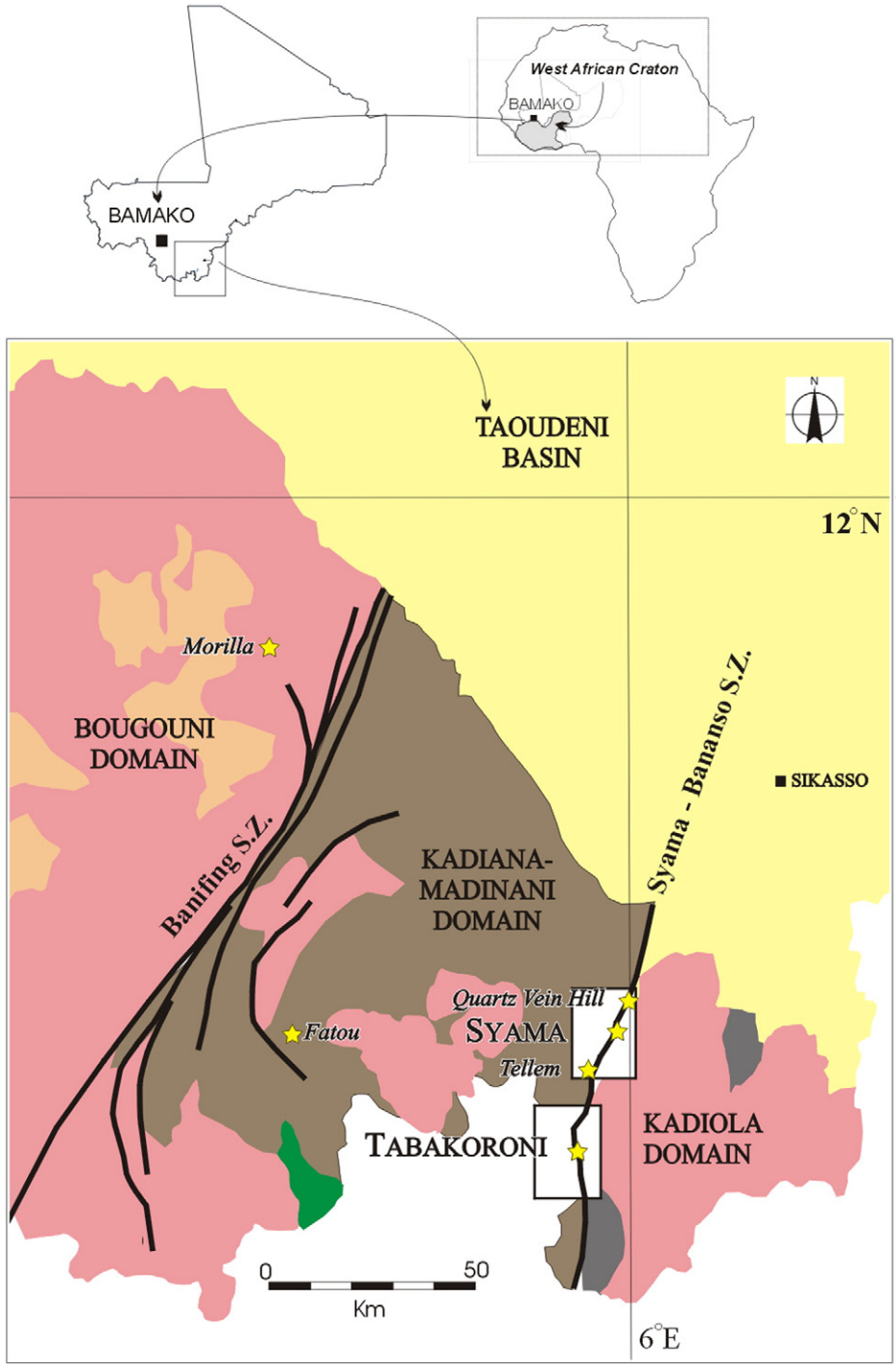

Fig. 1. Location map for the Syama and Tabaorni goldfeilds in southeastern Mali. The goldfields are hosted in a north-northeast trending, steeply west-dipping greenstone belt (Bagoe belt) that marks a regional boundary between the Kadiana-Madinani terrane to the west and the Kadiolo terrane to the east. The Bagoe Belt consists of sedimentary schists and metamorphosed greywackes, with subordinate basalt and intermediate volcanics and chert interflow sediments.

2. Exploration history

Gold mining in Mali has a long history with a peak in the 14th century when Emperor Kanku Moussa transported 8 t of gold on his pilgrimage to Mecca. Additionally, gold has been exploited in ancient Mali since the 5th century by artisanal miners. In the Syama region, the BRGM (Bureau de Recherche et Geologie Miniere) and SONAREM (Societe Nationale de Recherche Miniere) undertook region geological studies along the Bagoe river from 1960 to 1974 (Olson et al., 1992), which was followed by a regional sampling programme (1000 m × 200 m grid) over 25,000 km^2 initiated by the United Nations Development Programme (UNDP) and the Direction Nationale de la Geologie et des Mines (DNGM). By 1986, the United Nations reported an oxide resource of 1.5 Mt @ 1.67 g/t calculated from exploration pits (Kušnir et al., 1986).

Subsequently, BHP Minerals International defined several targets in the Syama permit and concluded that the Syama belt was under-explored both within the exploitation leases and at the regional scale.

In 1996, Randgold Resources Ltd. acquired all BHP's properties in Mali and took over management responsibilities of Syama. In 1997, a RAB drill programme was conducted north of Alpha pit and confirmed the extension of mineralisation. In 1998, a successful study of the oxide potential north of Syama delineated 12 targets, and an RC drill