



Progressive gold mineralization along the Syama corridor, southern Mali (West Africa)



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ABSTRACT

This contribution reports on three significant gold occurrences in southern Mali, the Syama and Tabakoroni deposits and the Tellem prospect, located in what is locally known as the Syama corridor. They are part of the Syama and Tabakoroni goldfields, which are the object of a twin paper in this issue (Ballo et al., this volume). They occur in the northern part of the Bagoé greenstone belt, which, in the study area, consists of a suite of Paleoproterozoic metamorphosed volcanic and sedimentary rocks. The sediments include conglomerate, black shale, sandstone and greywacke. The volcanic rocks have basaltic, andesitic and dacitic compositions. The basalts have flat rare earth element (REE) patterns, no Nb anomaly, and very low Zr/Y, whereas the latter two rock types are enriched in light REE, depleted in Nb, Ta and $Zr/Y > 7$. All rock units are crosscut by spessartite-type lamprophyre sills.

Even though the three gold occurrences are aligned along the same major structure, each one has distinct geological features including (i) the nature of the dominant host rock in the mineralized zone (a basaltic volcanic sequence at Syama, a diorite pluton at Tellem and a felsic volcanic sequence at Tabakoroni); (ii) the structural characteristics of the zone (highly mineralized breccias for Syama and vein stockwork for Tabakoroni and Tellem); and (iii) the main sulfides present (pyrite in association with arsenopyrite at Tabakoroni and Tellem and pyrite alone at Syama). At Tabakoroni and Tellem, gold mineralization occurred mostly during $D4_{Sy}$, whereas at Syama, a large part of the visible gold occurs as infill in fractures in breccia zones, likely related to a brittle, late E–W phase of shortening ($D5_{Sy}$).

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1. Introduction and brief exploration history

The study area is located on the northern edge of the Paleoproterozoic Baoulé–Mossi domain of the Leo–Man Rise (West African Craton; WAC), about 280 km southeast of Bamako, Mali's capital. This area contains several gold occurrences that form the Syama and Tabakoroni goldfields (cf., Ballo et al., 2016–this volume). Of these, the most important are the Syama and Tabakoroni deposits and the Tellem prospect, which are the object of this study (Fig. 1). They occur a few tens of km away from one another and are aligned along the NNE–SSW trending Bagoé belt (cf., Liégeois et al., 1991; Ballo et al., 2016–this volume), recently also known as the Syama belt (Parra-Avila et al., in press).

The Syama and Tellem deposits are owned by the Society of Mines of Syama SA (SOMISY) and are operated by Resolute Mining (80%) and the Malian government (20%). The Tabakoroni deposit is situated approximately 40 km south of the Syama mine and is part of the Finkolo

exploration concession, which was originally owned by a private Malian company, Bagoé SARL. Etruscan Resources acquired it in 2004 and entered into a Joint Venture agreement with Resolute Mining, who became the main operator of the permit (Woodman, 2009).

This paper forms the second part of a two-part study of gold deposits along the Syama corridor. The first paper (Ballo et al., 2016–this volume) documents the exploration history and geology of the various ore bodies (e.g. host rock lithologies and alteration), as well as the mining background. The goal of this contribution is to describe the general structure, nature and significance of the magmatic rocks and ore mineralogy of these gold occurrences, in an attempt to highlight their similarities and differences, and to propose a genetic model for gold mineralization in the Syama gold district.

2. Sampling and analytical methods

Over 80 samples were collected in the three deposits and surrounding area, from diamond drill cores and open pits. Petrographic study and scanning electron microscopy (SEM) were performed at the GET Laboratory, University of Toulouse. The SEM used was a JEOL 6360LV SEM, coupled to an energy dispersive X-ray spectrometer (SDD Bruker

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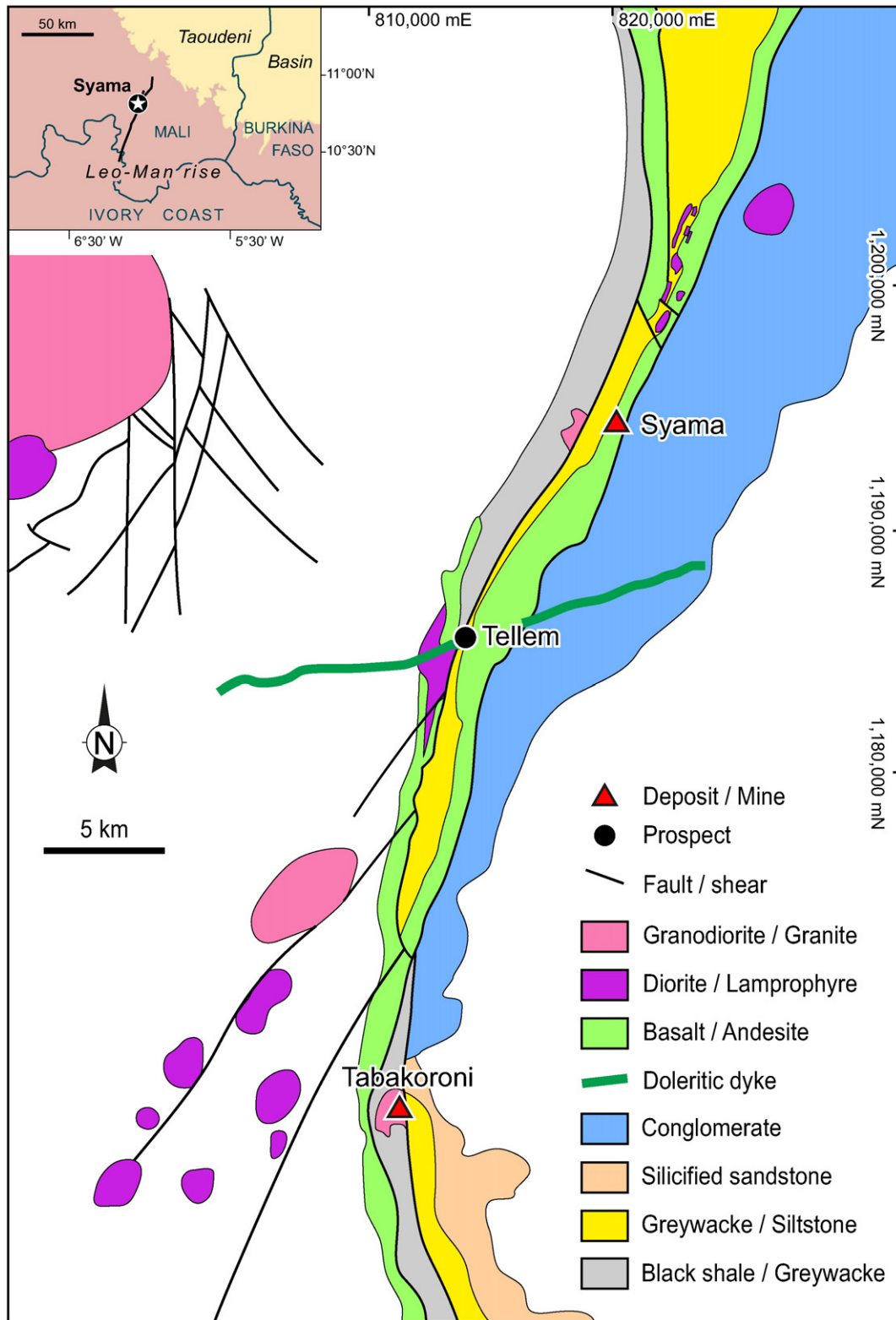


Fig. 1. Schematic geological map of the northern part of the Bagoé greenstone belt, locating the Syama and Tabakoroni gold deposits and Tellem gold prospect.

129 eV); images were acquired in backscattered electron mode at an acceleration voltage of 20 kV.

Whole-rock geochemical analyses were performed on 24 representative magmatic samples at Chemex Laboratories, Canada (see their website for method details, analytical precision and detection limits: www.alschemex.com). Major elements were analyzed by X-ray fluorescence spectrometry (XRF) using a lithium tetraborate fusion technique

for digestion. Rare Earth Elements (REE), high field strength elements (HFSE: Th, Nb, Y, Zr, Hf), Co, Cu, Zn, Cr, Ni, V, Mn, Pb, Ba and Sr were analyzed by Inductively-Coupled Plasma Mass Spectrometry (ICP-MS). Chemical compositions are presented in Table 1.

In-situ trace element concentrations of pyrite and arsenopyrite were determined by Laser Ablation (LA)-ICP-MS at Géosciences Montpellier (France). Analyses were performed using a Geolas (Microlas) Excimer

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