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The Nassara gold prospect, Gaoua District, southwestern Burkina Faso

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ABSTRACT

The Nassara-Au prospect is located in the Birimian Boromo Greenstone Belt in southwestern Burkina Faso. It is part of a larger mineralized field that includes the Cu–Au porphyry system of Gaoua, to the north. At Nassara, mineralization occurs within the West Batié Shear Zone that follows the contact between volcanic rocks (basalt and andesite) and volcano-sediments (pyroclastics and black shales) at the southern termination of the Boromo Belt. Gold is associated with pyrite and other Fe-bearing minerals that occur disseminated within the sheared volcanic and volcano-sedimentary rocks. In particular, highest grades are distinguished in alteration halos of small quartz–albite–ankerite veins that form networks along the shear zone. Here, pyrites are marked by As-poor and As-rich growth zones, the latter containing gold inclusions. Gold mineralization formed during $D2_{NA}$. Subsequent shear fractures related to $D3_{NA}$ related are devoid of gold. Nassara is a classical orogenic gold occurrence where gold is associated to disseminated pyrite along quartz veins.

1. Introduction

Gold deposits in the West African Craton (WAC) occur principally in Paleoproterozoic greenstone belts. The majority of these deposits are found along shear zones and, within these shear zones, commonly exhibit a structural control by second and third order structures (Milesi et al., 1992; Bourges et al., 1998; Allibone et al., 2002; Feybesse et al., 2006; Hammond et al., 2011; McCuaig et al., 2016; Salvi et al., 2016a, 2016c). The Nassara prospect occurs next to the Gaoua Cu–Au deposit (Figs. 1, 2), for which the copper mineralization is interpreted to be of porphyry style, while gold is believed to represent orogenic style mineralization that overprinted the porphyry event during late deformation (Sillitoe, 2007; Le Mignot, 2014; Baratoux et al., 2015; Siebenaller et al., 2015). The Nassara as well as other gold showings in this area (e.g., Gomblora, Batié West, Kampti), are probably related to the same mineralizing event responsible for the gold at Gaoua; insights on their genesis may thus reveal important findings in understanding the overall gold endowment process in this part of Burkina Faso. This paper provides summary information on the Nassara prospect, including its structural and mineralogical framework, allowing a comparison with other occurrences in the area, and in the rest of the WAC.

2. Exploration history

Gold and copper porphyry mineralizations in the Gaoua district were first identified by Compagnie Equatoriale des Mines (CEM) in 1929. Until 1938, CEM prospected for gold mineralization and a small lode was discovered near the village of Malba. This finding encouraged further exploration activities for gold and copper from 1941 to 1948 by the Direction Fédérale des Mines et de la Géologie (DFMG) through focussed regional mapping. In 1951, the Bureau des Mines de la France d'Outre Mer (BUMIFOM) produced maps at 1:100,000 scale where they realized regional geochemistry and tactical geochemistry for Cu and Co. Between 1965 and 1968, the United Nations Development Program (UNDP) conducted detailed geochemical and aerial photography surveys at 1:25,000 scale. From 1968 to 1970, a consortium consisting of the Burkina Faso government, Bureau de Recherches Géologiques et Minières (BRGM), Charter Consolidated ltd. and Omn Mines, undertook detailed geochemical surveys across the area (Marcelin, 1971). In 1976, the UNDP once again explored the Gaoua area as part of a regional scale study (ACP (African, Caribbean Pacific Group of States), 1994). The Gaoua Project area was acquired by the "Projet Minier Gaoua" in 1982. Their exploration work included regional stream sediment sampling, geochemical soil sampling, geological mapping at 1:10,000 scale,

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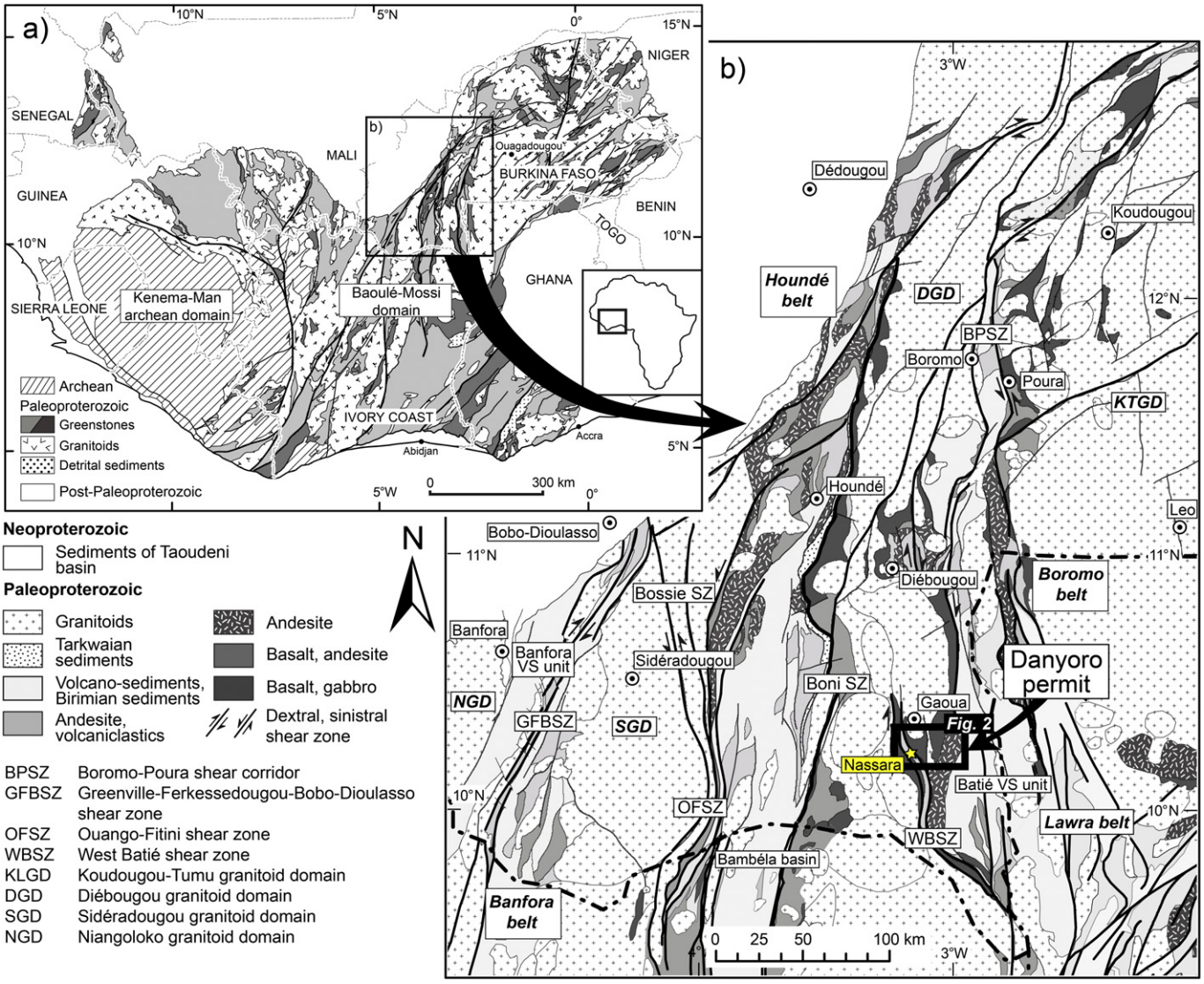

Fig. 1. a) Simplified geological map of the southern WAC (modified after the BRGM SIGAfrique map, Milesi et al., 2004). Paleoproterozoic greenstones are divided into: light gray — intermediate to acid volcaniclastics and volcano-sediments, dark gray — mafic to intermediate lavas and volcanic products. b) Simplified litho-structural map of SW Burkina Faso (Metelka et al., 2011) with the study area indicated.

ground based geophysical surveys, trenching, auger drilling, and diamond drilling. In January 2008, Goldcrest Resources merged with Birim Goldfields to form Volta Resources Inc. and their wholly owned subsidiary Gaoua Minerals, which were later acquired by B2Gold Corp. in December 2013. The Gaoua district is currently subdivided into 3 licenses; Souhouera, Malba and Danyoro, the former two including copper–gold porphyry mineralizations (Sillitoe, 2007; Naba, 2010; Naré, 2011; Baratoux et al., 2015; Siebenaller et al., 2015), while the Danyoro permit includes the Gongonburo, Poni, Gomblora, Nassara and Tonkalamine prospects. Prospecting in Nassara was carried out from 2005 to June 2014, initially under the direction of Wentworth Resources Pty. Ltd. (a subsidiary of Goldcrest Resources Inc.), and subsequently taken on by Volta Resources Inc. (from 2005) and B2Gold Corp. (from 2013). These studies consist in detailed field mapping, airborne geophysics and geochemistry (soil, stream sediment, litho-geochemistry), and lead to production of trenching, reverse circulation (58 holes) and diamond (34 holes) drilling. The total inferred and indicated resources from the Nassara Main ore body are about 143,000 oz of gold with an average grade of 0.78 g/t Au (Milogo, 2014). However, B2Gold Corp. has not yet certified the calculation of these estimates. Further general information about the prospect can be found in Table 1.

3. Geological overview

The southwest of Burkina Faso occurs in the central part of the Leo-Man shield in the Baoulé-Mossi domain (Fig. 1), which consists principally of Paleoproterozoic formations of the Birimian supergroup that are organized in roughly parallel sequences of greenstone belt–granitoid terranes (e.g., Baratoux et al., 2011). Most of these rocks underwent regional greenschist facies metamorphism, and were affected by large-scale shear zones trending N–S to NE–SW (Baratoux et al., 2011).

The Nassara gold prospect is located about 15 km south of the town of Gaoua, along the West-Batié Shear Zone (WBSZ) in the southern part of the Boromo Greenstone Belt (BGB) (Figs. 1, 2). Several gold and copper mineralizations were identified in this area, such as at Gongondy, Dienemera and Boussera, whereas only gold was found at Gomblora, Batié, and at Nassara (Fig. 2). The rocks in the Nassara area consist mainly of basalt, andesite, microdiorite, pyroclastics, rhyolite, dacite, chert and black shale (Baratoux et al., 2011; Metelka et al., 2011). The contact between massive volcanic units and sedimentary units is marked by intercalations of andesite and black shale layers (Figs. 2, 3). Dykes and small plutons of microgabbro and microdiorite intrude these rocks (Figs. 2, 3).