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## Discovery of the Hendou-abad copper mineral district and its association to dikes: a reconstruction scenario for exploration of Cu-porphyry, northeast Isfahan, Iran

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### ABSTRACT

The Hendou-abad copper mineral district is located along the eastern margin of the central part of Urumieh–Dokhtar Magmatic Arc (UDMA). The mineralization is hosted in the Late Eocene basaltic andesite and trachybasalt, where it is associated with epidote, calcite, and quartz as alteration minerals, and red, white, and green breccias. Two main events of mineralization with alteration have been distinguished: hypogene and supergene. Abundant parallel dike swarms intrude Late Eocene volcanic rocks of the Hendou-abad. The Hendou-abad dikes are seen as a few cm to 4 m wide and less than 1200 m long. The purpose of this work was to survey their petrogenesis and the tectonic implication of the dikes. Further, to investigate the relationship between dikes and known copper mineralization in Hendou-abad, and then examine exploration potential in adjacent areas. The Hendou-abad dikes, based on trend, relative age, and geochemical composition, are divided into two groups: early and late dikes. The geochemical character of these dikes displays an arc setting and the late dikes show higher contents of Nb, Zr, P, K, Rb, Ba, and slightly elevated Ti. The geochemical composition of the dikes suggests two magmatic stages over time: a subduction-modified mantle source is thought of for the host basaltic andesites and the early dikes in a primitive arc stage, while an enriched asthenospheric mantle source is pictured for the late dikes in a later, more mature arc stage. Structural evidences from field-work of dikes, strike-slip and thrust faults, and microscopic studies of the associated hypogene mineralization imply that they may have formed through north-south directed extension during an uplift event. The pattern of dike orientations, their intense propylitic alteration, and the spatially association with mineralized breccias, sheeted calcite, and mineralized quartz veins, could suggest emplacement of a porphyry stock at depth. Our data show that the east-trending green dikes are associated with red and green breccias in southern Ardestan and that they could be used as an exploration target for copper mineralization.

**Keywords:** *Mafic dike swarm; Breccia; Hydrothermal alteration; Hendou-abad Cu mineral district.*

### 1. Introduction

The Urumieh–Dokhtar Magmatic Arc (UDMA) is endowed with significant porphyry and epithermal ore deposits, such as Sungun, Kahang, and Sarcheshmeh in northwest, central, and southeast UDMA, respectively (Aghazadeh and Badrzadeh, 2015; Alavi et al., 2014; Afzal et al., 2012; Shahabpour, 2005). Sungun, Sarcheshmeh and a number of subeconomic porphyry

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