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### ► To cite this version:

Stéphanie Leroy, Eddy Foy, Enrique Vega, Mitch Hendrickson, Brice Vincent. Ironmaking activities in the Angkorian kingdom: characterizing (geo)resources for the knowledge of the metallurgical heritage. INTERNATIONAL CONFERENCE ON EARTH RESOURCES AND GEO-ENVIRONMENT TECHNOLOGY 2024, Institute of Technology of Cambodia, Dec 2024, Phnom Penh, Cambodia. hal-04861570

**HAL Id: hal-04861570**

**<https://hal.science/hal-04861570v1>**

Submitted on 2 Jan 2025

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# Ironmaking activities in the Angkorian kingdom: characterizing (geo)resources for the knowledge of the metallurgical heritage

Stéphanie Leroy<sup>1\*</sup>, Eddy Foy<sup>2</sup>, Mitch Hendrickson<sup>3</sup>, Enrique Vega<sup>1</sup>, B. Vincent<sup>4</sup>

<sup>1</sup> LAPA-IRAMAT, CNRS, CEA, Université Paris-Saclay, France

<sup>2</sup> LAPA-NIMBE, CNRS, CEA, Université Paris-Saclay, France

<sup>3</sup> University of Illinois at Chicago, USA

<sup>4</sup> Ecole française d'Extrême-Orient, France

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## Abstract:

*Evidence of ancient iron-making activities - in particular smelting and smithing - widely survive within the archaeological record. In part, these are waste products and artifacts whose materials contain information about the sources and resources used, as well as the techniques applied. Their study allows for understanding the metallurgical practices, tracing the origin of the production, characterizing the distribution networks of metal. Identifying the original places of the mineral sources used to produce iron, while key to understanding the labor organization and the features of production, is more difficult to address. Mapping mineral deposits is not enough to locate them, as iron oxides are commonly present in the soil and, for ancient metallurgy, even weakly enriched rocks - as in laterite- can be used to produce the metal. Remains are rarely accessible as the ores have been smelted; and the marks of past mining operations - when visible - can be confused with more recent ones, in the absence of accessible time markers.*

*IRANGKOR project has focused on evidences of iron-making activities in ancient Cambodia to understand the history of iron metallurgy in the Angkorian kingdom. The study of mineral evidences, metallurgical wastes and series of iron objects with a wide spatial and temporal (9th-14th c.) distribution has made it possible to document the characteristics of metallurgical practices, and the shifts in production. By cross-referencing these results with data from georesource characterization (type and chemical properties), and observations from field surveys - particularly around Phnom Dek and in Preah Vihear province - viable evidences on the location(s) of the mineral resources exploited for iron production during the Angkorian period were obtained. This article presents the results detailing the determination of their location, chemical properties and "geo-specificities" of the mineral in relation to the metallurgical heritage.*

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**Keywords:** Iron metallurgy; Angkorian kingdom; Georesources; Chemical Properties

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\* Corresponding author: Stéphanie Leroy

E-mail: [stephanie.leroy@cnrs.fr](mailto:stephanie.leroy@cnrs.fr); Tel: +33 670819109