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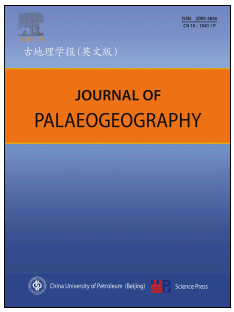

Origin and geochemical characterization of the glauconites in the Upper Cretaceous Lameta Formation, Narmada Basin, central India

Udita Bansal, Santanu Banerjee, Dhiren K. Ruidas, Kanchan Pande

PII: S2095-3836(17)30099-8

DOI: 10.1016/j.jop.2017.12.001

Reference: JOP 75

To appear in: *Journal of Palaeogeography*

Received Date: 5 September 2017

Revised Date: 9 November 2017

Accepted Date: 15 December 2017

Please cite this article as: Bansal, U., Banerjee, S., Ruidas, D.K., Pande, K., Origin and geochemical characterization of the glauconites in the Upper Cretaceous Lameta Formation, Narmada Basin, central India, *Journal of Palaeogeography* (2018), doi: 10.1016/j.jop.2017.12.001.

Journal of Palaeogeography, 2018, 7(2): xxx–xxx (001xx)

Geochemistry and sedimentary environments

Origin and geochemical characterization of the glauconites in the Upper Cretaceous Lameta Formation, Narmada Basin, central India

Udita Bansal, Santanu Banerjee*, Dhiren K. Ruidas, Kanchan Pande

Department of Earth Sciences, Indian Institute of Technology Bombay, Powai, Mumbai–400076, India

Abstract This study presents geochemical characteristics of glauconites in estuarine deposits within the Maastrichtian Lameta Formation in central India. Resting conformably over the Bagh Group, the Lameta Formation consists of ~4 to 5 m thick arenaceous, argillaceous and calcareous green sandstones underlying the Deccan Traps. The sandstone is friable, medium- to coarse-grained, well-sorted and thoroughly cross-stratified, and contains marine fossils. Detailed petrography, spectroscopy and mineral chemistry indicates unique chemical composition of glauconite with high K_2O, MgO, Al_2O_3 and moderate TFe_2O_3. Glauconite is formed by the replacement of K-feldspars, initially as stringers in the cleavages and fractures of feldspars. Incipient glauconite subsequently evolves fully, appearing as pellets. Fully-evolved glauconite pellets often leave tiny relics of K-feldspar. XRD exhibits characteristic peak of 10 Å from basal (001) reflection of glauconite, indicating the "evolved" character. The K_2O content of glauconites in the Lameta Formation varies from 5.51% to 8.29%, corroborating the "evolved" to "highly-evolved" maturation stage. The TFe_2O_3 content of glauconite varies from 12.56% to 18.90%. The PASS-normalized-REE patterns of glauconite exhibit a "hat-shape" confirming the authigenic origin of glauconites. The slightly-negative to slightly-positive Ce anomaly value and the moderate TFe_2O_3 content of glauconite agree well with a suboxic, estuarine condition. The replacement of K-feldspar by the glauconite contributes towards the high K_2O content. Compositional evolution of glauconites in the Lameta Formation is similar to those observed in many Precambrian sedimentary sequences.

Keywords Glauconite, Estuary, Mineral chemistry, Cerium anomaly, Redox condition, Lameta Formation

Received 5 September 2017; accepted 13 November 2017; available online xxx

1. Introduction

Modern glauconite forms in the depth range of 50–500 m and is most abundant between 200–300 m deep on the sea floor (Odin and Matter, 1981). There is a tendency to apply the same bathymetric interpretation for ancient glauconites. However, authigenic glauconite may form in a wide spectrum of shallow marine environments including wave-agitated estuaries and coastlines (Banerjee *et al*., 2015, 2016a; Chafetz and Reid, 2000). Very few studies, however, investigate the relationship between glauconite composition and palaeoenvironmental conditions (Banerjee *et al*., 2016b). K_2O and TFe_2O_3 content of glauconite varies with sedimentation rate, nature of substrate, and

* Corresponding author.
E-mail address: santanu@iitb.ac.in (S. Banerjee).
Peer review under responsibility of China University of Petroleum (Beijing).
http://dx.doi.org/xxxxxx