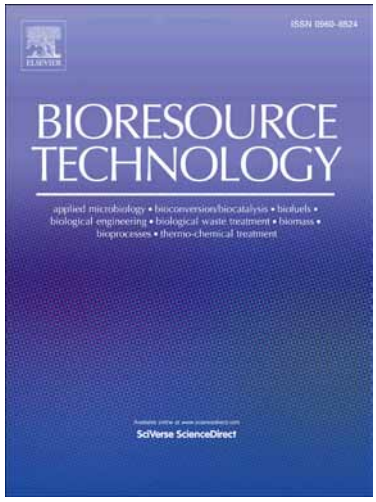

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PII: S0960-8524(17)30910-0
DOI: http://dx.doi.org/10.1016/j.biortech.2017.06.023
Reference: BITE 18260

To appear in: *Bioresource Technology*

Received Date: 13 April 2017
Revised Date: 2 June 2017
Accepted Date: 5 June 2017

Please cite this article as: Xu, X., Zhao, Y., Sima, J., Zhao, L., Mašek, O., Cao, X., Indispensable role of biochar-inherent mineral constituents in its environmental applications: A review, *Bioresource Technology* (2017), doi: http://dx.doi.org/10.1016/j.biortech.2017.06.023

Indispensable role of biochar-inherent mineral constituents in its environmental applications: A review

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Abstract

Biochar typically consists of both carbon and mineral fractions, and the carbon fraction has been generally considered to determine its properties and applications. Recently, an increasing body of research has demonstrated that mineral components inherent in biochar, such as alkali or alkaline earth metals in the form of carbonates, phosphates, or oxides, could also influence the properties and thus the applications. The review articles published thus far have mainly focused on multiple environmental and agronomic applications of biochar, including carbon sequestration, soil improvement, environmental remediation, etc. This review aims to highlight the indispensable role of the mineral fraction of biochar in these different applications, especially in environmental applications. Specifically, it provides a critical review of current research findings related to the mineral composition of biochar and the effect of the mineral fraction on the physicochemical properties, contaminant sorption, carbon retention and stability, and nutrient bioavailability of biochar. Furthermore, the role of minerals in the emerging applications of biochar, as a precursor for fuel cells, supercapacitors, and