Chapter 1

Introductory Chapter: How We Could Use Biochar in Engineering

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Additional information is available at the end of the chapter

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1. Introduction

The application of biochar has been shown to improve soil physical properties, especially in soils with bad soil structure or high bulk density. Biochar is made from a pyrolysis process that occurs spontaneously at the temperatures that **are usually below 700°C**. At its most extreme state, pyrolysis leaves only a carbon residue, which is called carbonization. The high temperatures used in pyrolysis induce polymerization of the molecules within the feedstocks, producing larger molecules and thermal decomposition of some feedstock components into smaller molecules. The remaining solid component following pyrolysis is charcoal, referred to as biochar, when produced with the intention of using it for soil improvement [2, 4, 5]. Basically, *biochar is known as a pyrolyzed carbon from solid waste used in agriculture since 1998*.

The use of burned residues in farming field has been carried for long lone time. The most near is Williams et al. [6], who discussed the advantages and drawbacks of burning versus incorporating straw in rice growing. Due to the rice husk, biochar has high silica (SiO_2) contents, and silicon (Si) is a beneficial element for plant growth that helps plants overcome multiple stresses including biotic and abiotic stresses. The benefits of silicon in crop production are, therefore, healthier plants and higher yield with fewer applications of pesticides and other chemical products [1]. Our recent studies also indicated that the application of rice husk, bamboo and woody biochar can change the physical properties on soil, and we also found that an application rate of 10 t ha^{-1} should not be exceeded when applying biochar on these soils [3]. Expected for the agriculture applications, the engineered biochar materials have attracted more attentions in recent years, especially for the ZERO WASTES production of agriculture in the world. Through self-heating, to convert such wastes into functional biochar materials can gain different benefits than that of biological conversion. **The editor hopes that the development of biochar can cross its application field from agriculture into engineering.**

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