Japan Biochar Association Standard JBAS 0001

Biochar for Soil Carbon Storage

002 (2025)

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Foreword

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Introduction

Fossil fuels are concentrated carbon that has been retained under the Earth for more than 300 million years. We are exhausting such resources in less than 300 years after its discovery. If the carbon, once retained underground, is released into the atmosphere in the form of carbon dioxide, it will undoubtfully accelerate climate change. Given the evolution of living things, only green plants vegetating on land and in water biospheres are able to absorb carbon dioxide from the atmosphere.

On the other hand, the practice of utilizing biochar products, which are produced from the green plants, as a soil conditioner for agriculture and forestry has been established long before in Japan. We also have experiences with biochar products that are useful in reinforcing plant growth and increasing productivity as well as maintaining sustainable soil fertility.

We suggest a plan of ~~an~~ atmospheric carbon dioxide reduction ~~plan~~ by integrating the above-mentioned two phenomena. This plan is ~~are~~ as follows : To pyrolyze plants or plant-derived organic matters into highly stable and refractory carbon products as biochar and to confine them underground or underwater for a long period of time to mitigate the increase in carbon dioxide in the atmosphere and eventually to reduce carbon dioxide concentration in atmosphere. Specifically, we plan to storage biochars made by pyrolyzing non-hazardous unutilized organic biomass generated from agriculture, forestry, and fishery industries such as branches, leaves, and thinned timber, as well as livestock excrement, from building industry such as waste wood, and from food industry such as plant residues and food wastes, and to massively apply them in agricultural and forested lands and/or park green spaces and/or bury them under road surfaces. This standard provides the technical framework for this plan. Its purpose is to define the parameters for evaluating biochar for soil carbon storage and to systematically develop measurement methods for the parameters.

1. Scope and Philosophy

This standard defines measurement methods for raw materials of biochar and biochar products for soil carbon storage. Self-combusting carbonization without help of fossil fuel may contribute to reduction in atmospheric carbon dioxide through carbonization of organic resources. On the other hand, biochar products vary in characteristics depending on their raw materials and pyrolysis methods. If the standard is intended to have high quantitative precision, therefore, it may become complicated. It is also highly likely to have a negative effect on the propagation of soil carbon storage technology. Therefore, its range of application is defined in

accordance with the following philosophy.
The raw material shall be reasonably expected to be useful in decreasing atmospheric carbon dioxide levels and has no socioeconomically inconvenient effects. Measurement methods shall be, based on existing scientific knowledge, practical and economically feasible methods that anyone can handle.

2. Terms and Definitions

Some terms used in this standard are defined as follows.

a) Biochar

Biochar refers to pyrolyzed materials derived from biological resources, in which the ratio of volatile matter content relative to refractory carbon content, as determined by the method specified in Section 4, is less than 0.6. Note that the biochar defined here is estimated to be pyrolyzed at temperature of 350°C or higher.

b) Bulk density

Bulk density is defined as the value obtained by dividing the mass of sample material by container volume they occupied.

c) Refractory carbon

It refers to carbon and carbon compounds which poorly decompose under natural conditions. Quantitative values of this refractory carbon shall be measured by quantitatively described in Section 4.

d) Mass conversion factor for refractory carbon

It is a factor used to determine the mass of refractory carbon contained in a given volume of biochar materials from the volume value.

$$\alpha = \frac{m_{rc}}{V}$$

where

α : mass conversion factor for refractory carbon (kg/m^3)
m_{rc} : mass of refractory carbon (kg)
V : biochar volume (m^3)

The calculation for obtaining the mass of refractory carbon shall be performed as below.

$$m_{rc} = V \times \alpha$$

The volume of biochar material is determined with the following formula.

$$V = \frac{m_{bw}}{D} \times \frac{1}{1000}$$

where

m_{bw} : biochar weight (kg)

D : bulk density (g/cm^3)

Bulk density is determined by measurement in accordance with Section 4.

Mass conversion factor for refractory carbon is determined by measurement in accordance with Section 4.

Simplified mass conversion factors for refractory carbon listed in Table 1 may be applied to mass conversion factors for refractory carbon provisionally. (Note that when using the equivalent for more than two (2) years, in principle, the coefficient determined by measurement in accordance with Section 4 shall be used.)

Table 1 Simplified mass conversion factors for refractory carbon

Raw materials for biochar	Simplified mass conversion factors for refractory carbon (kg/m^3)
Woods and bamboos	100
Rice hulls	30

3. Raw Materials for Biochar

Raw materials for biochar shall meet at least one (1) of the following requirements.

a) Wood, bamboo, or their products that are free from foreign matter, paints, adhesives, antiseptics, chemicals, or any toxic substances.

b) Biologically derived organic resources that are free from foreign matter, paints, adhesives, antiseptics, chemicals, or any toxic substances.

4. Measurement Methods

JBAS 0002 Biochar for Soil Carbon Storage - Measurement Method - shall be applied for measurement.

5. Labelling

Each container of biochar products shall be labelled or attached information to indicate the following information.

(1) Standard name (“Biochar for soil carbon storage”)
(2) Name of raw materials
(3) Net mass or volume
(4) Production number or lot number

(5) Manufacturer name or its abbreviation
(6) Manufacturing date or its abbreviation
(7) Mass of refractory carbon