

# Stability and safety of Biochar

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# 1. Background

1. Stability and safety could be first priority issues for Biochar
  - How long dose “Bicohar” last (decomposition) ?
  - How long dose function of “Biochar” last ?
  
  - Is it safe during manufacturing process and after application to land??
  
  - Fruitful research should be expected.



## 2. Objective

Therefore, objective of this article

Introduction of our discussion in Japan and research highlights on these issues.

# 3. Stability (Previous research)

1. Function of biochar has been studying without crop cover at Okinawa by Dr. Y. Komiya.

(On going after 8 years application)

2. Decomposition on wooden char has been studied by many researchers. Some research is found in Japan.

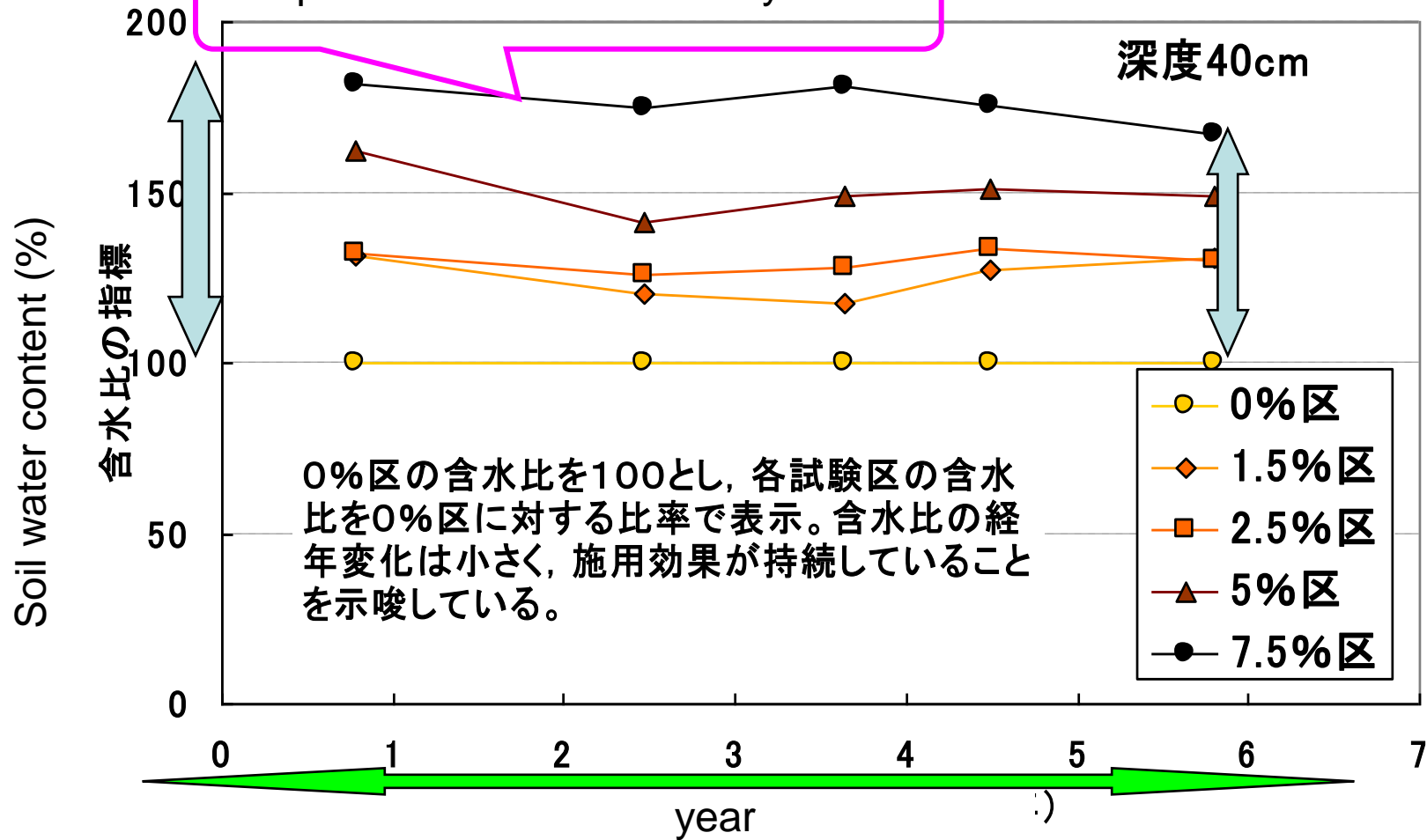


# 3-2 Function lasting study

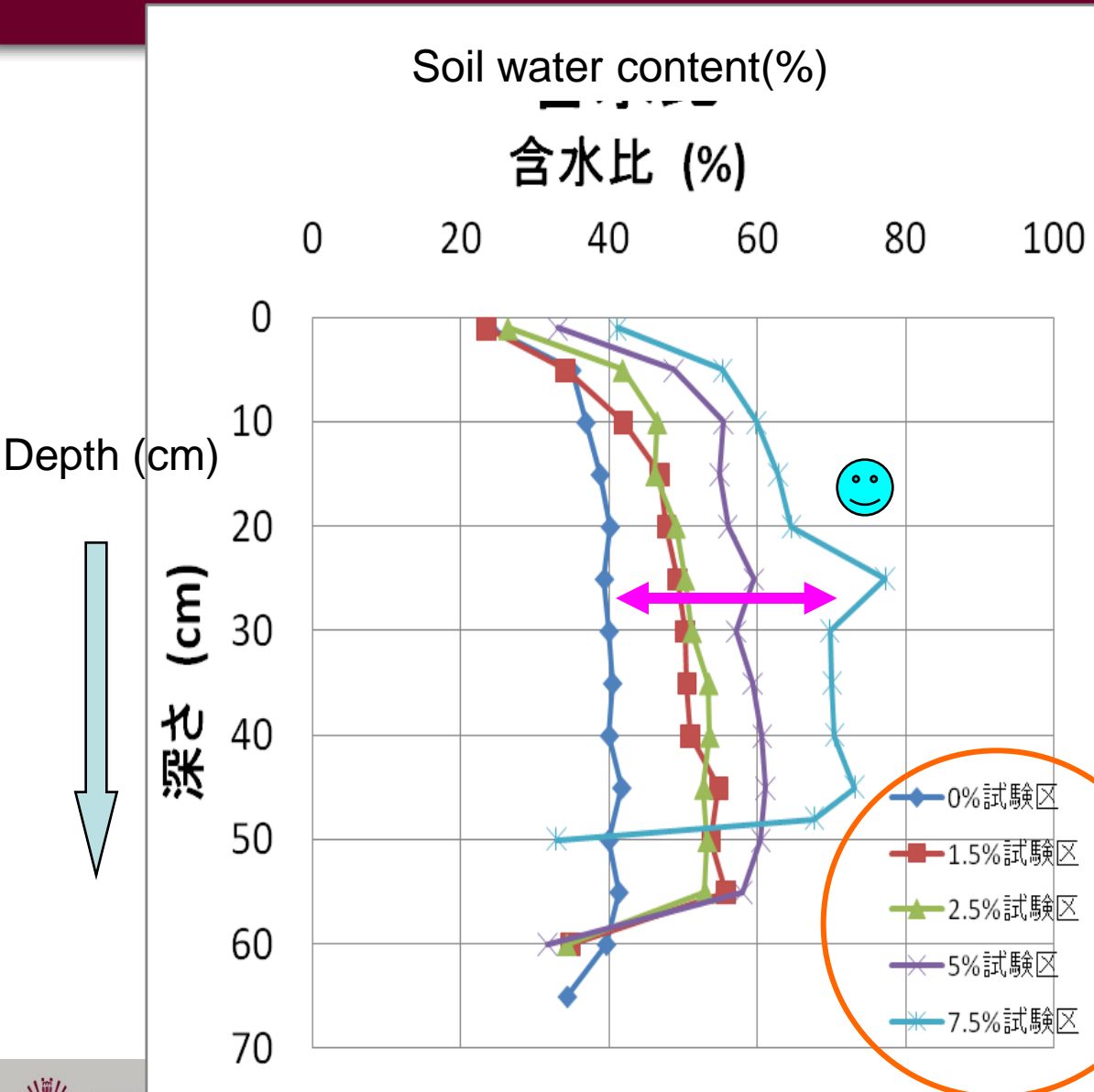


# Lasting (water holding capacity)

Impact continue around 10 years!!



# Long term observation



Application (mixture) of charcoal from bagasse.

It enables to increase available water (moisture) of the soil (crop) and it can held (last) more than 55 months after application.

Courtesy to Professor Y. Komiya (Ryukyu Univ. Japan)



# 3-1 Decomposition of wooden-char

One research program with six field sites in Japan has been on going for another two years (Carbon sequestration program funded by (MAFF; Ministry)).

Our research group members have been devoting.

Some kinds of observations with same procedure have been carrying out with different crops, soils, regions, etc.



1. Representatives; Sampling place, depth, numbers, volume, weight, etc.
2. Different back ground with different parameter (soil science, soil mechanics, soil physics, soil-microorganism etc.)
3. Test procedure; how can we certify anti-decomposability for about probably 100 years.
4. How can we assess with comprehensive parameters such as fixed carbon? Is it feasible or not??

We have been discussing among our related researchers.



# 4. Safety (Expected issues)

## (1) Manufacturing process

- 1) Dioxin
- 2) Cyanogen
- 3) NO<sub>x</sub>, SO<sub>x</sub> gas

## (2) After Application (Heavy metals leaching)

## (3) Storage (easy to burn)

Table Composition of Syngas

Concentration (ppm)	400°C	600°C
Dioxin (ng-TEQ / m <sup>3</sup> N)	0.047	0.0044
Dust (g/m <sup>3</sup> N)	0.04	0.083
HCl (mg/m <sup>3</sup> N)	99	66
SO <sub>x</sub> (vol-ppm)	230	150
NO <sub>x</sub> (vol-ppm)	110	130
Chloride (vol-ppm)	0.1以下	0.1以下

However, especially in lower temperature, dioxin is observed.

Some kinds of biochar can be expected to absorb dioxin.

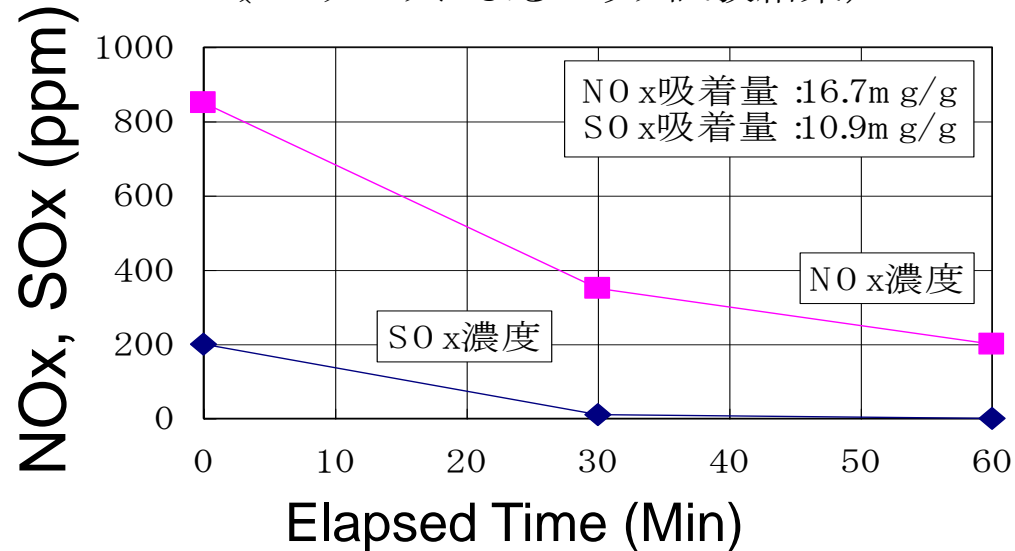
- 「The amount of benzene used as an alternative substance of dioxin into the active cokes (**char**) had a similar quality to a commercial active char (**carbon**) produced from coal in terms of adsorption per unit specific surface area. A. MITOMO et. al. ; Production and Performance of Active Cokes by Carbonation of Sludge for Removal of Pollutants in Combustion Gas of Wastes [in Japanese], KAGAKU KOGAKU RONBUNSHU 29(5), 635-639, 2003-09-20 』
- 「Unburned carbon in the flyash had almost equal T4CDD removal efficiency to activated carbon., M. FURUBAYASHI ; Study on Dioxin Removal Efficiency of Various Adsorbents [in Japanese], KAGAKU KOGAKU RONBUNSHU 28(3), 273-279, 2002-05-20 』





## Gas absorption with Biochar

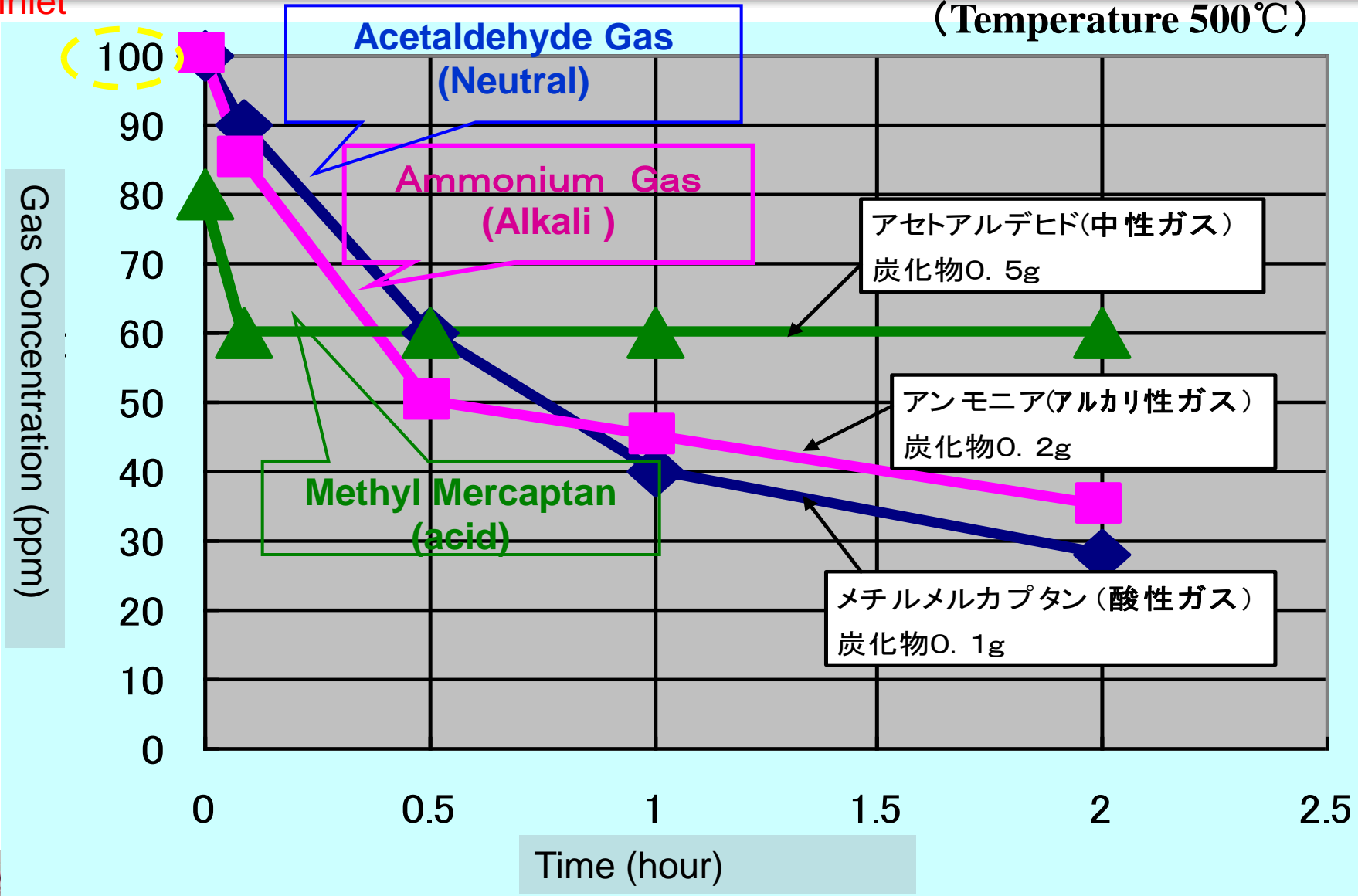
炭化汚泥によるNO<sub>x</sub>、SO<sub>x</sub>吸着能力  
(デシケータによるバッチ試験結果)



# Absorbent function for various

gas.  
Inlet

(Temperature 500°C)



The heavy metals in biochar except arsenic is reported as free acid type possession and form kinds of crystal minerals and not be leached easily. (H. Yamamoto (2003)).

→ Great incentives for land application.

Char is reported to be burned (ignite) easily.  
Sometimes fired by itself. (Especially, for lower manufacturing temperature.)

Counter measure is just wetting (sprinkling water to heat down) or storage with iron cans.

Danger to store with such as polyethylene bag.

Extra care is expected for black dust while storage and application.



There are many issues for stability and safety of biochar.

We do not have enough research to overcome.

Further research with effective network will be greatly expected.

We are willing to cooperate with you!!



















