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高電圧パルスパワーを用いた模擬土壌の酸化能と殺菌能の評価
Evaluation of Oxidation and Fungicidal Activity of Simulated Soil Using High Voltage Pulse Power

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INTRODUCTION

In the case of same crop is cultivated continuously on the same land, continuous cropping obstacles occurs. The biotic factors of the continuous cropping obstacles are mainly caused by the increase of specific fungi in the soil. Previously, methyl bromide has been used to prevent continuous cropping obstacles by its sterilization effect. However, methyl bromide has been classified as a Class 1 stratospheric ozone depletion substances, which prohibits its use [1]. Recently, sterilization of the soil using the high voltage pulse power is being considered. High voltage pulsed power generates various chemical species and plays an important role in the sterilization effect [2]. In this study, the influence of soil depth and compaction on the oxidation capacity of the electric discharges was investigated.

EXPERIMENTAL SETUP

Four tungsten needles placed above the soil surface with a gap length of 10 mm were used as high voltage electrodes. Stainless-steel disc was used as grounding electrodes and put at the bottom of the soil. A magnetic pulse compression circuit (MPC) was used as the power supply, and the voltage and pulse width were 13 kV and 250 ns respectively. Indigo carmine solution was used for the evaluation of oxidizing ability by the decolorization. The bulk density of the simulated soil was changed from 0.17 g/cm3 to 0.31 g/cm3 by compaction using iron bars.

RESULTS AND DISCUSSION

These results Figure 1 shows the amount of the indigo carmine for the three soil depths with (B) and without (A) compaction. The decolorization of indigo carmine without compaction is deeper than that with compaction. The void ratio in the simulated soil decreases with compaction. Active species such as ozone and hydroxyl radical produced by pulsed discharges could hardly penetrate into the simulated soil with low void ratio. Therefore, the oxidizing ability was higher without compaction.

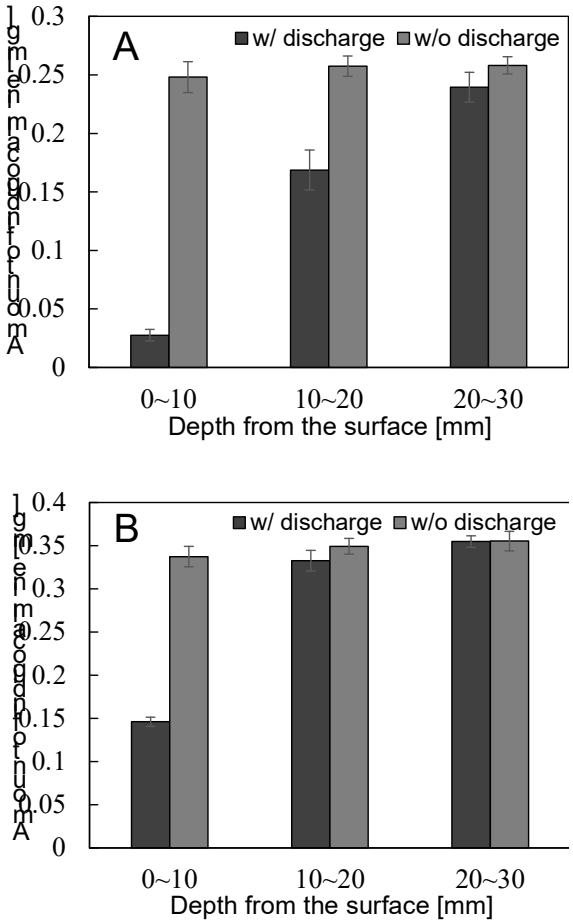

Fig. 1. Transition of the amount of indigo carmine. (A: without compaction, B: with compaction)

REFERENCES

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[2] T. Sato et al., Plasma Processes and Polymers, Vol. 5, No.6, pp. 606-614(2008).