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酸素ラジカル殺菌中のミドリカビ胞子の形態変化

Morphological variation of *P. digitatum* spores in oxygen-radical inactivation

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Introduction: There are many reports that microorganisms are inactivated using non-equilibrium atmospheric pressure plasma (NEAPP) and various biological functions can be changed by plasma treatments. Some papers reported that bacteria were morphologically varied by NEAPP irradiation using a scanning electron microscopy (SEM). We showed that reactive oxygen species (ROS) changed the function of cell membrane or cell wall without major morphological change in cell membranes by fluorescent observation, which leads to cell inactivation.[1] Moreover, we reported that ground-state atomic oxygen [$O(^3P_{j=0,1,2})$] in ROS is the dominant factor responsible for inactivating *P. digitatum* spores.[2, 3] However, we have not analyzed the morphological changes of *P. digitatum* spores exposed by only neutral oxygen radicals in detail. In this study, we have investigated the relation between morphological change and fluxes of oxygen radicals.

Experimental: The chamber containing an atmospheric-pressure oxygen radical source, which supplies only neutral species, was purged with Ar gas to eliminate the influence of atmospheric gases.[4, 5] The spores were exposed to oxygen radicals for 7 min, 10 mm downstream from the radical exit of the oxygen radical source set at a $O_2/(Ar+O_2)$ flow rate ratio of 0.6% with a total flow rate of 5 slm, which is a typical condition for inactivating the spores. The treated spores were fixed in a 3% glutaraldehyde solution, coated with gold particles and then observed by SEM.

Results: Figure 1 shows the SEM images of control spores (A) and radical-treated spores (B). These results indicated that radical treatment does not cause major morphological changes with respect to the shapes and surface geometries of spores. These results suggest that oxygen radicals do not damage surface morphologies of spores, but penetrate into spores and directly affect various functions of intracellular organelles.

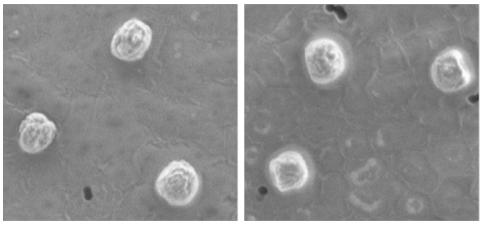
[1] T. Ohta. et al., the 59th Spring Meeting of JSAP, 16p-B8-3 (2012).

[2] S. Iseki, et al., Appl. Phys. Express, **4**, 116201 (2011).

[3] H. Hashizume, et al., the 73rd Fall Meeting of JSAP, 13a-E1-35 (2012).

[4] M. Iwasaki, et al., Appl. Phys. Lett., **92**, 081503 (2008).

[5] H. Inui, et al., Appl. Phys. Express, **3**, 126101 (2010).



(A)　(B)

Fig. 1 SEM images of (A) control spores and (B) spores treated with oxygen radicals.