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ROS/RNS Production in Water Using Various Discharge Plasma KAZUHIRO TAKAHASHI, KOHKI SATOH, HIDENORI ITOH, HIDEKI KAWAGUCHI, Muroran Institute of Technology, IGOR TIMOSHKIN, MARTIN GIVEN, SCOTT MACGREGOR, University of Strathclyde — A pulsed discharge, a DC corona discharge and an atmospheric pressure plasma jet are generated above water, the off-gas of a packed-bed dielectric barrier discharge (PB-DBD) is sparged into water, and then reactive oxygen species and reactive nitrogen species in the water are investigated. H_2O_2, NO_3^- and a trace of NO_2^- are produced in the water after the plasma exposure. H_2O_2 concentration decreases when NO_3^- concentration increases, so that this is likely that OH radical to produce H_2O_2 by OH + OH $\rightarrow$ H_2O_2 is consumed in the NO_3^- production by NO_2 + OH $\rightarrow$ HNO_3 $\rightarrow$ NO_3^- + H^+ (in water). Since no species is detected in water by the sparging of the PB-DBD off-gas containing more than 1000 ppm of O_3, O_3 does not contribute to produce H_2O_2 in water. Further, only NO_3^- is produced by the sparging of the off-gas containing N_2O_5 and HNO_3. This leads that H_2O_2 and NO_2^- can be produced by short-lifetime species in plasma. In this work, the highest generation efficiency of H_2O_2 and NO_2^- are respectively 3,820 μg/Wh and 830 μg/Wh by the pulsed-plasma exposure, and that of NO_3^- is 2,530 μg/Wh by the off-gas sparging of the PB-DBD.

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