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## Discharge Characteristics of Water Thermal Plasmas

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Thermal plasma has some unique advantages including high enthalpy, high chemical reactivity, and selectability of reaction atmospheres. By making use of these merits, thermal plasma has been utilized especially in waste treatment. Water plasma is a kind of thermal plasma directly generated from water. Large amount of H, O, and OH radicals exist in the water plasma, thus hydrogen-rich gas is generated from the decomposition of organic wastes. From this point, water plasma system is expected to be a biomass gasification device with high hydrogen concentration compared to conventional gasification method.

Arc fluctuation in the water plasma was examined by arc image observation synchronized with voltage measurement. Axial and radial extent of the arc was observed by high-speed camera. Temperature measurement on microsecond timescale was also achieved by the high speed camera system. Two synchronized images of atomic hydrogen in different wavelengths were observed through appropriate band-pass filters with negligible other emissions from the arc. Then, the arc temperatures in water plasma system with and without organic compounds were measured based on Boltzmann-plot method. Measured arc temperature in water plasma without organics was 9000 K while that with Methanol or D-glucose was under 8500 K. These temperatures were sufficiently high for complete decomposition of organic wastes. Obtained results revealed that the water plasma system with reactive radicals such as H, O, and OH is suitable high temperature source for waste decomposition.