Small Microwave Plasma Torch for Disinfection

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Atmospheric plasma is a potential tool for medical applications because it can provide charged particles, reactive species, and ultraviolet light which have a bactericidal effect, and treat substances which aren't resistant to vacuum. In order to optimize a plasma condition, it is necessary to control each of the agents. In this contribution, we aim to control the UV irradiation on treated samples.

In our group, a small atmospheric plasma torch has been developed for the purpose of disinfection. The torch consists of a 24 mm long aluminum tube, a quartz glass tube and a titanium powered electrode of 1 mm in diameter with a sharpened tip. The powered electrode is placed coaxially in the quartz tube covered by the aluminum tube. Plasma was produced between the tip of powered electrode and the quartz tube by microwave of 1.7 W at 2.45 GHz and Ar flow of 500 sccm. The produced plasma inside the torch flows out from the opening of the torch (2 mm in diameter). To control UV power on samples two nozzles were developed, one has a straight shape and the other is a bended. With the straight nozzle the light from the plasma production region reaches the sample while with the bended nozzle there is almost no light irradiation on the sample since the plasma is produced only around the electrode.

When *E. coli* cultures inoculated on an agar plate were treated by the plasma, a clear bactericidal effect was observed with two nozzles. In both cases, the gas temperature at the sample was ~300 K. The efficiency with the bended nozzle was smaller than that with the straight nozzle. The reduction of the efficiency is due to less reactive species and charged particles and the absence of UV light because the length of the bended nozzle is longer.