
Coanda Effect utilization in Plasma Reactor for Water Treatment

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Water scarcity has become one of the most serious problem of our civilization. Therefore, cleaning of the industrial, agricultural and municipal waste water is an urgent need. The current mainstream of the water treatment is based on the composite processes consisting of sedimentation, absorption, filtration, bio-treatment, ozonation and chemical dosing. Recently, non-equilibrium atmospheric pressure plasma has opened a new door in a field of environmental and biological sciences such as pollution control, plasma medicine and agriculture, and is expected to be a promising method for next-generation water treatment. To produce plasma at atmospheric pressure, various kinds of plasma sources have been developed including a plasma jet, pulsed streamer corona, dielectric barrier discharge (DBD), and surface discharge. Discharge can be realized in air, water surface or in water. These plasma sources produce reactive oxygen and nitrogen species, such as $\cdot\text{OH}$, O^{\cdot} , $\text{O}_2^{\cdot-}$, O_3 , H_2O_2 , NO , HNO_3 , etc.

In this presentation we present a coaxial cylindrical type plasma reactor in which the pulsed discharge is used for the generation of streamers in air-liquid interfacial discharge with and without a barrier such as a glass tube in between the powered and grounded electrodes. Additionally, we introduced the swirling water flow generated by the Coanda effect. The water residence time was increased and mixing of the water and several radicals occurred effectively by the electrohydrodynamic effect. The positive effect was confirmed by the decolorization experiment using dyed solution.