GAS BUBBLE DISCHARGE OPTIONS FOR DISINFECTING AND CLEANING WATER

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The work is devoted to the development of technology for disinfecting and purifying water using discharges in gas bubbles. Bubbles are obtained inside the water by injecting gas into the water (for example, from a compressor). When discharging in gas bubbles (for example, air) inside water takes place, a complex of high-intensity factors is generated in them, including electrons, OH radicals, atomic oxygen, hydrogen peroxide, ozone (O_3), broadband radiation, including ultraviolet, etc. This combination of factors provides significantly more effective disinfection and purification of water than ozonation, which is confirmed experimentally.

Variants of discharges inside gas bubbles in water may be different.

A variant of discharges inside small gas bubbles with line characteristic dimension of any single bubble l_b~1 mm exists. In such bubbles, discharges are carried out due to the breakdown voltage induced in them (direct current voltage, alternating, or pulsed), which is substantially less than the total applied voltage. In this case, the electrodes between which the full voltage is applied are located outside the bubbles. This version of discharges has some similarities with partial discharges in gas inclusions in solid and liquid dielectrics.

There is a variant of discharges in gas bubbles with a characteristic linear size of an individual bubble l_b ~ 1 cm or more. In such bubbles, discharges can be carried out by positioning the tip of the high voltage electrode inside the bubble. In this case, almost all of the total external voltage is applied to this bubble and can be tens or more kilovolts; when the voltage rises on the bubble, there is no energy loss due to leakage currents in the water. This variant (type) of discharges can be divided into two main subspecies:

1. a discharge from the tip of the high-voltage electrode inside the bubble through the gas bubble to the interface of water volume and gas bubble and further through the layer of water to the low voltage (grounded) electrode;

2. a discharge from the tip of the high-voltage electrode inside the bubble along to the interface between the bubble and water and then through a layer of water to a low-voltage (grounded) electrode.

It is known from the high voltage technique that the breakdown voltage along the interface between two media is always less than the breakdown voltage through for each of the two media. Therefore, the working electric field strengths, the number, and intensity of accumulated disinfecting and water-purifying factors in subspecies 1 discharges in gas bubbles are greater than in subspecies 2, ceteris paribus.