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Underwater electrical discharge in plate to plate configuration[1]
VITALIY STELMASHUK, Institute of Plasma Physics of the Czech Academy of Sciences — Two main configurations of high voltage electrodes submersed in water have been used for an electrical discharge generation: pin to pin and pin to plate. An electrical breakdown between plate electrodes is generally difficult to reproduce, because there is a uniform and weak electric field. One major advantage of using plate electrodes is their greater "wear hardness" to high-energy discharges. The plate electrodes can withstand extremely high energy deposition at which the pin electrode is quickly destroyed. The electrical discharge between plate electrodes can be initiated by creating an inhomogeneity in the electrical field. Two methods of discharge initiation between plate electrodes are proposed for this aim: 1) focusing of a shock wave in the interelectrode region; 2) a bubble injection into the electrode gap. The shock wave creates favourable conditions for the electrical breakdown between the two plate electrodes: it causes that numerous microbubbles of dissolved air start to grow and serve as locations for streamer initiation. In the second method the gas bubble is injected from the one of the electrodes, which has a gas inlet hole on the lateral face for this purpose. A "volcano" like morphology of positive streamers are observed in the experiments with weak electric field.

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