



سمینار هفتگی ماده چگال نرم

## Plasma Directly Generated in Liquids as an Innovative Method to Treat Cancer

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### Abstract

Despite all the continuous advances implemented to the treatment approaches of cancerous diseases and the improvement in their early diagnosis, cancer is up-to-the-minute a major clinical challenge and the cause of the second highest death incidence worldwide. Even if diagnosed in early stages and treated by surgery, chemotherapy and/or radiotherapy, aggressive forms of cancer can still lead to a very bad prognosis. This suggests the strong need for new therapeutic alternatives more efficiently tackling cancerous cells. In the recent years, atmospheric pressure plasma technology has started to be increasingly explored as a possible cancer treatment strategy. In contrast to the majority of other cancer treatments, one of the major advantages of plasma is its selective anti-cancer ability. Two basic methods are considered for applying cold plasma in oncology: 1) the direct treatment in which living cancerous cells, tissues or organs are directly exposed to plasma and 2) the indirect treatment in which a liquid is first subjected to a plasma treatment after which the obtained plasma-activated liquid (PAL) is brought into contact with cancer cells. The latter approach is currently attracting the interest of researchers since most cells and tissues are surrounded by liquids. The present study launches an innovative approach in which plasma is generated in the liquid phase directly. To do so, an APPJ operating in argon was used to activate distilled water in its bulk. The effect of different operational parameters such as plasma exposure time, applied voltage and gas flow rate were studied on the following liquid characteristics: H<sub>2</sub>O<sub>2</sub> concentration, NO<sub>2</sub><sup>-</sup> concentration, pH, temperature and conductivity. In order to confirm the beneficial cancer-responsive properties of the obtained PAL, in vitro cell tests will be performed on different healthy and cancer cell types. If proven to selectively kill cancer cells, this novel approach will be a breakthrough paving the way towards the treatment of cancer.

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