Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Cell Internal Treatable Microplasma Jets in Cancer Therapies
JAE YOUNG KIM, YANZHANG WEI, JINHUA LI, SUNG-O KIM, Electrical and Computer Engineering, Center for Optical Materials Science and Engineering Technologies, Clemson University — We developed a 15-μm-sized, single-cellular-level, and cell-manipulatable microplasma jet device with a microcapillary glass tip and described its potential in physical cancer therapies. The microcapillary tip is a funnel shaped glass tube and its nozzle has an inner diameter of 15 μm and an outer diameter of 20 μm with 20° capillary angle. The electrical and optical properties of this plasma jet and apoptosis results of cultured murine B16F0 melanoma tumor cells and CL.7 fibroblast cells treated with the plasma jets were described. In spite of the small inner diameter and the low gas flow rate of the microplasma jet device, the generated plasma jets are stable enough to treat tumor cells. The microplasma jet was observed inducing apoptosis in cultured murine melanoma tumor cells in a dose-dependent manner. Furthermore, the percentage of apoptotic cells of murine melanoma tumor cells induced by this plasma device was approximately 2.5 times bigger than that of murine fibroblast cells as indicated by an Annex V-FITC method. This highly precise plasma medicine, which enables new directed cancer therapies, can be combined with current cell manipulation and cell culturing technologies without much difficulty.

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Date submitted: 15 Jul 2011 Electronic form version 1.4