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3D printed electrodes for a dielectric barrier discharge ROBERT ALBERTSON, Princeton Plasma Physics Laboratory, SOPHIA GERSHMAN, Advanced Research Innovation in Science Education (ARISE), ANDREW ZWICKER, Princeton Plasma Physics Laboratory — The affordability and advancements in 3D printing technology make it the method of choice for prototyping and development. We investigate how the thickness and density of 3D printed electrodes affects the formation of microdischarges inside a dielectric barrier discharge (DBD) surface modification reactor. We use a Makerbot Replicator II 3D printer to manufacture the electrodes by encasing thin pieces of copper tape in PLA plastic. The DBD setup consists of a cylindrical aluminum HV electrode which is surrounded by a layer of 5mm thick Alumina and is connected to a 15kV, 75-300 kHz, AC power supply. The printed electrodes are grounded and held 5mm beneath the Alumina, forming a discharge gap. The DBD is operated with Ar/Air and Ar/O_2/Air mixtures at atmospheric pressure. A PI-MAX 3 ICCD camera is used to image the microdischarges at various stages of their development. The image analysis suggests that the printed electrodes with a thicker plastic layer and a greater infill density have more uniform discharges. Quickfield electric field simulations suggest that the field inside the discharge gap is distorted near the surface of the electrodes due to irregularities in the printed material. These results can be used to guide the future design of 3D printed electrical components.

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