Abstract Submitted
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Gas and heat dynamics of a micro-scaled atmospheric pressure plasma jet[1] JUDITH GOLDA, Ruhr-Universitaet Bochum, Experimental Physics II, 44801 Bochum, Germany, SEAN KELLY, MILES M. TURNER, School of Physical Science and National Centre for Plasma Science and Technology, Dublin City University, Dublin, Ireland, VOLKER SCHULZ-VON DER GATHEN, Ruhr-Universitaet Bochum, Experimental Physics II, 44801 Bochum, Germany — Low temperature atmospheric pressure plasma jets enable the production of reactive species. Therefore, they are used for surface modification and considered for use in bio-medicine. Bio-medical applications demand stability of the discharge and knowledge of the temperature of the plasma effluent and the device components. While treating heat-sensitive biological material, the threshold temperature of the tissue must not be exceeded. Additionally, chemical processes in the discharge strongly depend on the gas temperature. However, heating in such discharges is still poorly understood. To assess this problem, we investigated the geometric design of the microscaled atmospheric pressure plasma jet based on a reference jet which is proposed by the European COST group MP1101. Thermocouple measurements and numerical model data show a bounded exponential temperature growth described by a single characteristic time parameter. Where the carrier gas exits the device, peak temperatures range from 297 K to 381 K in "alpha mode" operation for flows of 2 - 0.25 slpm. Spatial profiles of surface heating, obtained by thermal imaging, are found to correlate strongly with the impacting plume where peak temperatures occur in regions of maximum surface helium concentration.

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