関係者各位

東北大学工学研究科
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「仙台プラズマフォーラムのお知らせ」

春暖の候、ますます御健勝のこととお慶び申し上げます。
さてこのたび，下記日程で講演会を開催したいと考えております．ご多忙中大変恐縮ではございますが，ぜひともご出席賜りますようよろしくお願い申し上げます.

「仙台プラズマフォーラム」

日時：2013 年(平成 25 年) 5 月 1 日 (水) 13:00～

会場：東北大学工学研究科 電気情報系　451・453 会議室　(情報新棟 4 階)

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題名：Experiments and modeling of gas heating in a radio-frequency plasma jet

要旨：　次頁参照

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Experiments and modeling of gas heating in a radio-frequency plasma jet

Rod Boswell presenting research from: Amelia Grieg, Sam Dixon, Christine Charles, Rhys Hawkins and Peter Alexander

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Small plasma sources have been developed for a variety of applications and are often known as plasma jets (e.g. biomedical applications using atmospheric pressure helium or argon plasmas), as micro-plasma sources or arrays [1] (e.g. surface processing using lower operating pressure plasmas), or as micro-thrusters (e.g. electric propulsion using hollow cathode thrusters or neutralizers). At the ANU we have designed a capacitively coupled radiofrequency (13.56 MHz) cylindrical plasma source which currently operates at pressures around a few Torr and at powers ranging from 1-100 Watts with or without a pressure gradient imposed along the 2 cm long cavity [2]. The plasma diameter ranges from 1 to 6 mm before expanding in a larger chamber. Neutral gas heating is measured for a variety of gases (argon, nitrogen, xenon) and cavity diameters using optical emission spectroscopy. The results are combined with electric probe measurements to develop a plasma heating model where the heating is assumed to come from ion-neutral collisions in the maximum of the discharge under the powered electrode. A peaked density on axis is well described by the plasma model [2]. Typically, gas temperatures around 1000K are measured for N_2 and Ar in agreement with theoretical predictions from Fruchtman [3]. The results show that this type of source can be tailored to suit a variety of plasma applications: its effectiveness in dissociating species means that it can be used for remote plasma etching [1] or for surface passivation from atomic nitrogen using N_2. It can also be developed as an electrothermal plasma micro-thruster for space propulsion[2]. All of these applications benefit from the neutral gas heating and from the ability of the source to be developed as an array of sources.

REFERENCES:

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[2]C. Charles and R.W. Boswell, "Measurement and modeling of a radiofrequency micro-thruster", Plasma Sources Sci. Technol. 21, 022002, 2012

[3]A. Fruchtman, "Energizing and depletion of neutrals by a collisional plasma", Plasma Sources Sci. Technol. 21, 022002, 2012