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P4.3005 Oxygen production by CO2 dissociation using a pulsed plasma discharge for Mars missions

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Any future space missions involving people on board must solve the problem of oxygen required for life support. In the case of Mars oxygen is not present in the rarefied atmosphere. We suggest a possible approach to solve the oxygen problem for Mars missions by the use of a high power coaxial plasma gun to split the dioxide carbon molecule in the fundamental components [1]. The Martian atmosphere is made up mainly of CO_2 (95.9%), Ar (1.9%), and N_2 (1.9%). Carbon dioxide can be split into oxygen for life necessities and CO that can be used as propellant for space travel. To dissociate CO_2 we use a coaxial plasma gun using two electrodes made of tungsten. The coaxial plasma gun is powered by a capacitor charged up at 1 to 2 kV. The ejected plasma has a peak electron temperature of 5~15 eV and a peak electron density of ~10^21 m^(-3). Spectroscopic analysis of several oxygen emission lines (e.g. 615 nm and 777 nm) in the discharge at a pressure in the range 1-5 torr show a clear dissociation of CO_2, which depends of the amount of power injected into the discharge.

[1] C.M. Ticos, A. Scurtu, D. Ticos, New J. Phys. 19, 063006/1-11 (2017).

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