Supplementary Information

Dielectric barrier discharge-assisted determination of methylmercury in particulate matter by atomic absorption spectrometry

Gilberto da S. Coelho Junior; Klaiani B. Fontana; Tatiane A. Maranhão; Daniel L. G. Borges*

Universidade Federal de Santa Catarina (UFSC), Departamento de Química, 88040-900 Florianópolis, SC, Brazil

*Corresponding author

E-mail address: daniel.borges@ufsc.br

1. DBD apparatus

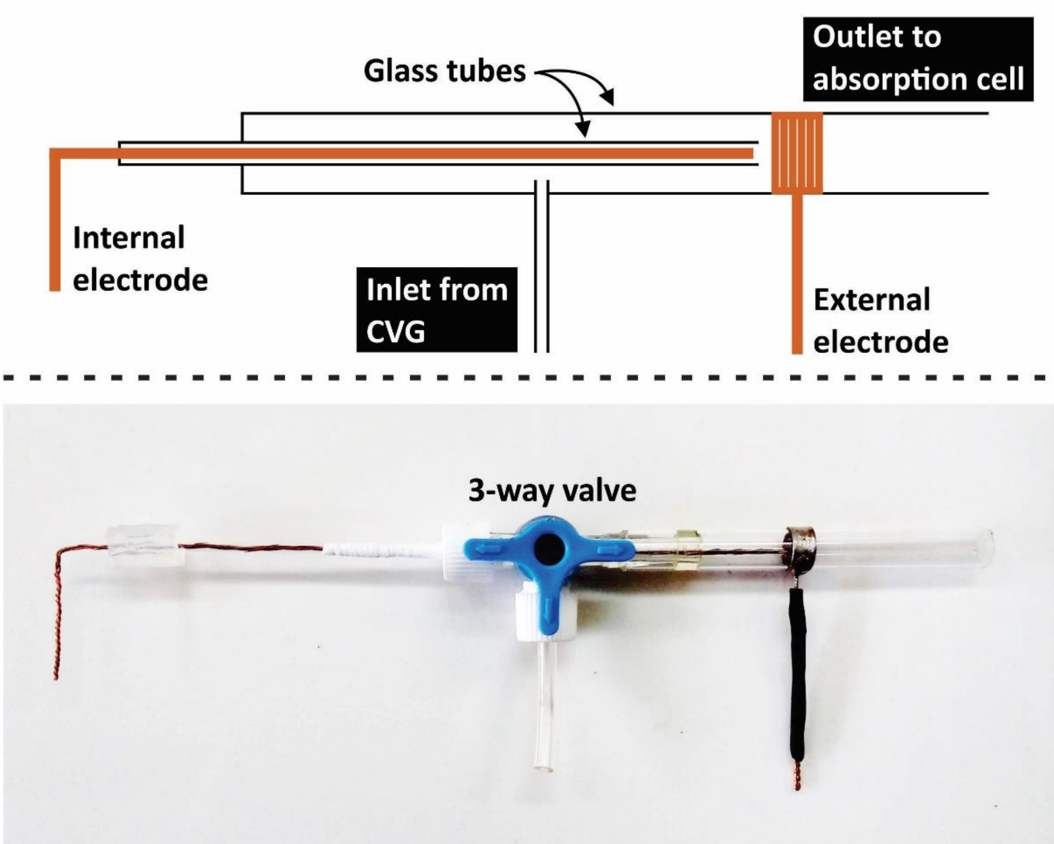

Figure S1. Lab-made plasma jet DBD device using cooper wires as internal and external electrodes, a glass tube as a dielectric barrier and a 3-way valve connected to the chemical vapor generation device.

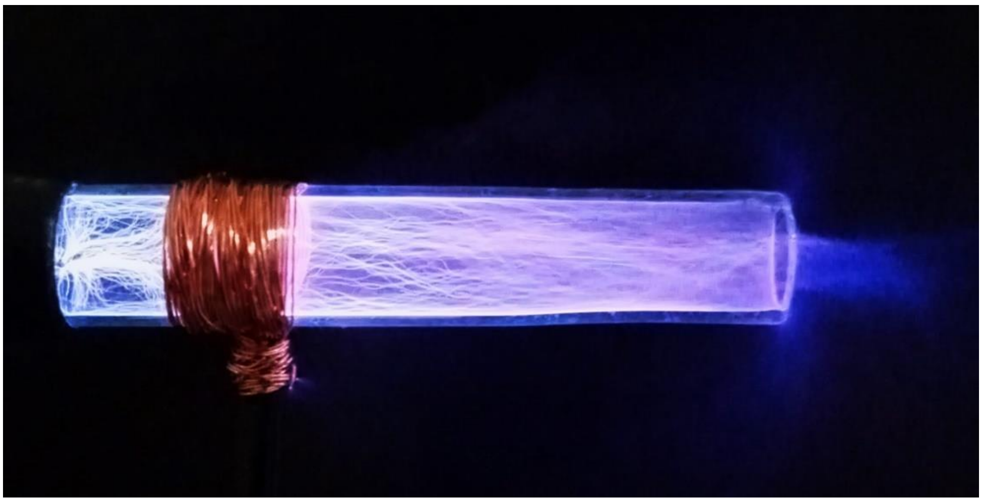

Figure S2. Photograph of the DBD device in operation. The power supply parameters used were established as a voltage of *ca.* 60 kV, frequency of 15 kHz, duty cycle of 50% and argon flow rate of 250 mL min^{-1}.

The electronic circuit of the power supply used to generate the DBD plasma was completely developed in our laboratory. In this system, a rectifier linear power supply was assembled to rectify the alternating current (AC) of 230 V commonly used in the laboratory to approximately 15 V in direct current (DC). Then, this DC has was converted into square wave pulses using a pulse width modulation (PWM) module and a power transistor (with an aluminum heat sink). These pulses were used in a transformer to elevate the voltage to a range of kV. As a means to obtain an approximate measurement of the voltage generated by the device, a test was performed based on the dielectric barrier of air, which has an approximate value of 3 kV mm^{-1} (Bednar *et al.*, 2013). Based on this property, it was possible to stipulate the value of the high voltage generated by the device considering the distance of the electric arc generated between the two electrodes. Thus, taking into account that the measurement of the electric arc distance between the two electrodes was approximately 20 mm, it is possible to infer that the voltage generated by the device is approximately 60 kV.

The schematic diagram of the electronic circuit is shown in Figure S3 and the respective components used in this power supply are specified in Table S1. It is important to point out that the 10 turns of cooper wire used in the transformer TR2 were assembled directly on the ferrite core. Additionally, the "DBD OUTLET 1" means the high voltage wire of the transformer TR2, while the "DBD OUTLET 2" means the bottom pin of the transformer.

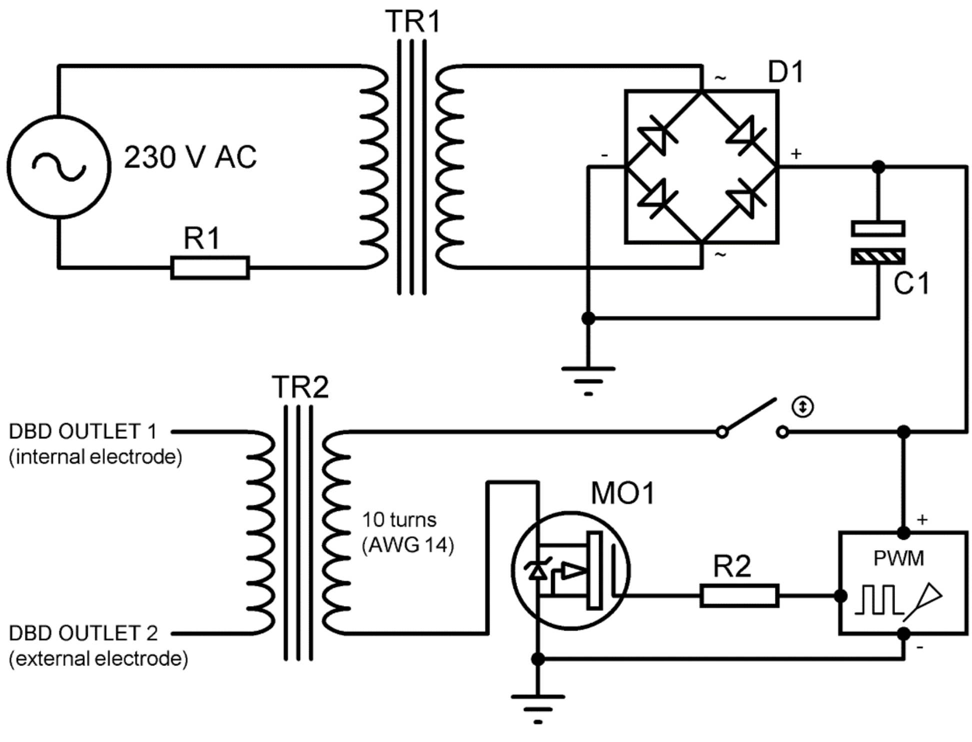

Figure S3. Schematic diagram of the electronic circuit assembled for the DBD power supply.

Table S1. Electronic components used to assemble the electronic circuit of the DBD power supply represented in Figure S2.

Component	Specification
TR1 – Transformer	230 V / 12 V (13.3 A)
TR2 – Transformer	TV Flyback model 334p07409
D1 – Diode bridge	GBU8J
C1 – Electrolytic capacitor	11.5 mF / 50 V
MO1 – Transistor	MOSFET IRFZ44N
R1 – Resistor	200 Ω / 80 W
R2 – Resistor	100 Ω / 0.25 W
PWM – Module generator with adjustable frequency and duty cycle	1 Hz to 150 kHz

2. DBD hyphenation with the AAS equipment

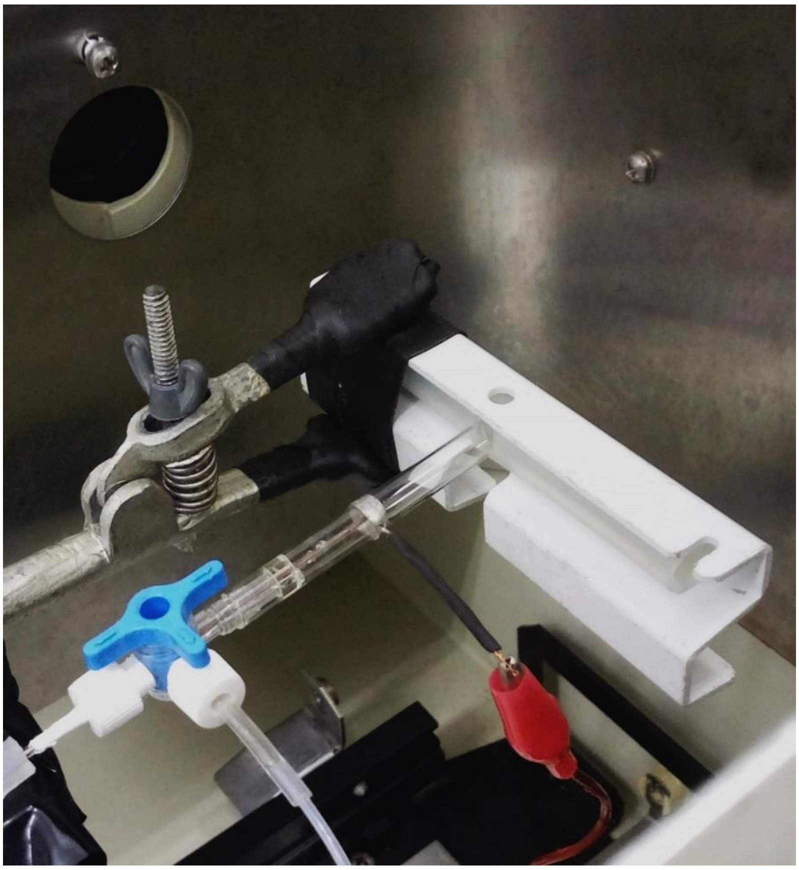

Figure S4. Photograph of the DBD device coupled to the absorption cell in the AAS instrument.

REFERENCE

N. Bednar, J. Matovic, G. Stojanovic, *Journal of Electrostatics*, 2013, **71**, 1068.