Development of DC magnetically well-type cathode and thermal plasma torch for treatment of hazardous wastes

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The 30 kW DC plasma torch system with the well-type cathode (WTC) has been developed to generate thermal plasma above 1200 0C, which is adding the external magnetic coil on the cathodic part of the torch as shown in Figure 1. The well-type torch is hollow cylindrical copper's 5 mm thickness, whose cathode electrode and anode electrode was 150 mm in each length, the diameter is 22 mm through the center, The gap between both electrodes is 1.5 mm isolated with a swirl gas ring. Under the experimental conditions at 0.5 - 0.8 MPa compressed air is applied to both sides of the torch, the airflow rate is 60 L/min and 120 L/min from the sides, and above, as followed. the thermal plasma has been generated, their maximum current is 200 A and 160 V, the length is about 30 cm, its diameter about 3 to 5 cm wide, recognized UV emission has been present.

In this work, the 500 G of the magnetic field produced by an external solenoid has been developed, to drive the arc root and reduce the cathode erosion damage.[2,3] The result shows the necessity of a magnetic field, a rotational arc root inside the cathode surface, and electrode life hours are compared with the case of un magnetic field-driven has been present. Finally, the knowledge of this work to extend electrode life and applied to the system to be suitable for the disposal of infectious wastes.

References
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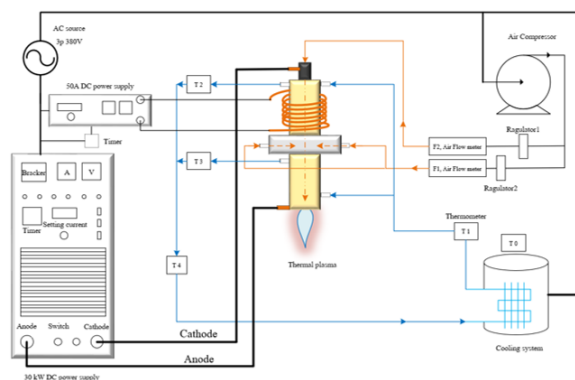[3] P. Freton and et.al., J. Phys. D: Appl. Phys. 42, 195205 (2009)

Figure 1 30 kW DC plasma torch system with the well-type cathode (WTC) and external magnetic field.