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The corrosion behavior in the plasma torch electrodes

The biggest problem faced by plasma torch operation is the corrosion of electrodes. The effects of corrosion will lead to material loss and a short lifetime of plasma operation. To overcome this problem, the corrosion behavior of electrodes by plasma arc is investigated using Comsol simulation. The plasma arc is generated based on breakdown voltage following the Paschen curve. The five interfaces are provided for studying the corrosion event in electrode; there are heat transfer in solids and fluids interface, electric currents interface, heat transfer in liquids interface, plasma interface, and equilibrium dc discharge in multiphysics interface. Carbon dioxide is used as gas within the torch, while graphite is material for electrodes. Electric potential, initial electron density, and heat flux in the torch are varied to investigate the corrosion rate. The results are concluded in part of accumulated heat rate, convective heat flux, temperature, and collisional power loss at electrodes.

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