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### Title

Effect of self-bias on transport of vacuum arc plasmas through magnetic filters

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Curved magnetic filters are commonly used with cathodic vacuum arcs to remove macroparticles from the plasma stream. Such filtering is necessary for high quality of coatings for semiconductor and optical applications.

Since pioneering work of Aksenov and co-workers it is known that biasing the filter positively improves plasma throughput and thus deposition rate. For systems operating with pulsed arcs and open filters, it is practical and economical to use the arc current for generation of magnetic filter field. This approach eliminates the need for a magnet supply and also reduces the overall power consumption and cooling needs.

This solution has the additional advantage that higher currents can be utilized than one would use for DC systems, and higher currents can be advantageous for obtaining highest system coefficients. There was, however, no means to supply bias to the filter due to the fact that the bias capacitor couples to the pulse forming network of the arc supply, i.e., essentially becoming part of it.

In this study, "self-bias" was introduced using a low-ohm resistor between the anode of the arc source and the filter entrance. The self-bias obtained from a 50 m $\Omega$  resistor, for example, with a current of 300 A will cause a voltage drop of 15 V, which is known to be about the right amount needed to improve transport of plasma. The system coefficient was determined using a negatively biased ion collector placed at 200 mm from the filter exit. Current measurements were done via wide-band Pearson current transformers. Data acquisition was accomplished using a 500 MHz, 2 Gsample/s, 4-channel digital oscilloscope.

Experiments confirm that bias of pulsed filters can be realized simply by using the voltage drop across a self-bias resistor. Under optimum conditions, almost 100 A of filtered copper ions have been obtained in pulsed mode, corresponding to a system coefficient  $k \cong 0.04$ . No transport limit has been found when the arc current was increased. Further results, including floating potentials as a function of arc currents and radial probe position, will be presented.

— Special requests for placement of abstract:

— 3.1 Plasma, Ion and electron sources

Special requests for equipment: \_\_\_\_\_

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