This technique allows time dependent variations of chosen spectral lines to be recorded electronically. Such an investigation is currently being undertaken at Imperial College by Adcock and Plumtree,[5] who are seeking to correlate the temperature measurements with arc instability data.

The conclusions of Pfender and Cremers[1] that the argon arc temperature data are for a steady state condition are probably correct for most facilities; there is evidence,[6] however, that at very low pressures instabilities can occur in argon arcs. The more interesting question relating to the problem still remains unresolved; namely, what is the mechanism that creates arc instabilities in hydrogen, helium, and nitrogen but does not affect the stability of the argon arc column?

References

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[4] Carruthers, R. and Davenport, P. A., "Observations of the instability of constricted gaseous discharges," Proc. Phys. Soc. **B**, Ser. 70, 49, 50(1957).

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Reply by Authors to P. G. Simpkins

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SIMPKINS mentions in his comment that arc "instabilities" did not occur when argon was used as working fluid. This is not in agreement with the paper to which he refers.[1] In this paper the following statement is made: "The results show that two distinct modes of operation occurred: 1) a steadily burning arc, characterized by an almost constant voltage drop between the electrodes; and 2) an unstable arc, recognizable by large amplitude fluctuations in the voltage. When argon was being used as the test gas, both types of operation were observed, the unstable arc occurring only at low mass flow rates."

Investigations in the Heat Transfer Laboratory of the University of Minnesota have revealed the same two modes of operation in an argon atmosphere with a simplified electrode geometry[2] as well as with the F40 plasma torch. The transition from one mode to the other could be predicted by a critical Reynolds number that indicates that the mode of operation is governed largely by gasdynamic effects. The current only had a minor influence on the mode of operation and on the transition from one mode to the other. However, the parameter range investigated in these studies was not wide enough for drawing final conclusions. Therefore, these results are considered to be of a preliminary nature. The arc arrangement certainly is significant for the arc mode. Nevertheless, the same modes of operation at different parameter settings may be observed with different arc geometries.[3] From preliminary tests in other gases (nitrogen, hydrogen), it seems that the mode of operation also depends strongly on the working fluid. With the latter gases, the restriking frequency of the fluctuating arc increases and the parameter range for which the steady mode prevails becomes smaller. It seems conceivable also that the current may have an appreciable influence on the mode of operation in the higher current range where magnetic body forces are of importance.

A distinction should be made between arc instabilities and arc fluctuations. Changes in the arc length accompanied by changes in the arc voltage, which are not related to magnetohydrodynamic instabilities, should be designated as arc fluctuations. Magnetohydrodynamic instabilities to which Simpkins also refers in his comment[4] occur predominantly in high current discharges at low pressures, where the pressure caused by the self magnetic field is of the same order of magnitude or larger than the gas pressure. This situation does not exist in arcs at atmospheric pressure for a current range of several hundred amps.

In conclusion, we agree with Simpkins' statement that the sensitivity of the arc with respect to fluctuations varies with the working fluid. However, the mechanism that triggers these fluctuations seems to be the same for all of the gases that have been investigated. For a given arc geometry the parameter range for which the steady mode prevails may be rather wide for argon,[2] but, nevertheless, the fluctuating mode occurs also. With nitrogen and hydrogen, the parameter range for the steady mode is rather narrow, and, thus, one usually observes the fluctuating mode using these gases as working fluid.

References

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[4] Carruthers, R. and Davenport, P. A., "Observation of the instability of constricted gaseous discharge," Proc. Phys. Soc., **B**, 49 (1957).

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Errata: "Physics of Meteor Entry"

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[AIAA J. **3**, 385–394 (1965)]

IN this paper† it was stated (on p. 389) that the technique used by Millman and Cook[1] to determine the final mass of a meteor was unclear, because the system appeared to be

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† The nomenclature is that of the subject paper.

underspecified, with only three equations for the four unknowns of the problem. I am grateful to both Dr. Millman and Dr. Cook[2] for pointing out that a straight line fit to

$$(\sigma/K)^{3/2}\, m_p = (I/\rho v^6)^{3/2} \tag{1}$$

vs

$$m_p - m_{pe} = \int_t^{t_e} \frac{I}{v^3}\, dt' \tag{2}$$

at three epochs (the last being t_e) yields the slope $(\sigma/K)^{3/2}$ and the intercept $(\sigma/K)^{3/2}\, m_{pe}$ at $t = t_e$. Obviously, division of the second quantity by the first yields the final mass m_{pe}, and (σ/K) is obtained from the first quantity.

I also would like to correct an error in the definition of the ballistic parameter φ, following Eq. (7) of the subject paper, which should read

$$\varphi = (2m\alpha \sin\gamma)/C_D A \tag{3}$$

Also, Eq. (32) should read

$$v^2/v_\infty{}^2 = 1 - 2\rho/\varphi_\infty$$

in order to be dimensionally correct.

References

[1] Millman, P. M. and Cook, A. F., "Photometric analysis of a spectrogram of a very slow meteor," Astrophys. J. **130**, 648–662 (1959).

[2] Cook, A. F., private communication, Smithsonian Astrophysical Observatory, Cambridge, Mass. (August 1965).

Erratum: "A Single Formula for the Velocity Distribution in the Turbulent Inner and Outer Boundary Layers"

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[AIAA J. **3**, 1766–1768 (1965)]

In the previous article, there is a mismatch in the illustrations and their captions. Figures 1 and 3 should be interchanged.

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