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Microdischarge-based pressure sensors utilizing multiple cathodes for operation up to 1000°C SCOTT WRIGHT, YOGESH GIANCHANDANI, University of Michigan — High temperature pressure sensors have uses in numerous industrial sectors including gas turbine engines, coal boilers, internal combustion engines, and oil/gas exploration machinery. Microdischarges are well-suited for high-temperature operation because of the inherently high temperatures of the ionized species that sustain them. This work describes sensors that operate by measuring the change, with pressure, in the spatial current distribution of pulsed DC microdischarges. The spatial current distribution is determined from the current in two cathodes, with different interelectrode spacing, and the differential current is treated as the output. At low pressures, current favors the farthest cathode while at high pressures, the opposite occurs. Two versions of the sensors are reported. The first type uses 3-D arrays of horizontal bulk metal electrodes embedded in quartz substrates with electrode diameters of 1–2 mm and 50–100-μm interelectrode spacing. These devices were operated in nitrogen over a range of 10–2000 Torr, at temperatures as high as 1000°C. The maximum measured sensitivity was 5420 ppm/Torr, while the temperature coefficient of sensitivity was as low as -550 ppm/K. Sensors of the second type use planar electrodes and have active areas as small as 0.13 mm^2 with a maximum sensitivity of 9800 ppm/Torr.

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