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Recommendations for the design of interference probes for the simultaneous measurement of turbulent concentration and velocity[1] ALAÍS HEWES, LAURENT MYDLARSKI, McGill University — The present work focuses on the design and optimization of a thermal-anemometry-based interference probe used to simultaneously measure concentration and velocity at relatively high temporal and spatial resolutions in turbulent flows. Although a small number of similar measurements have been successfully performed, little work has been undertaken to investigate the design of such specialized probes, in which one hot-wire sensor is operated downstream of, and micrometers from, a second one. To this end, experiments performed in the non-buoyant region of a helium-air jet were undertaken to study the effects of overheat ratios, wire separation distances, wire diameters, and wire materials on the performance of interference probes. They revealed that accurate concentration and velocity measurements require that an interference probe have two wires of differing diameters with a small separation, of about 10 μm, between the wires. Furthermore, the upstream wire should be operated at a high overheat ratio and the downstream wire at a low one. An optimal design for an interference probe is presented, and measurements made in a turbulent jet are used to benchmark its accuracy.

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