

Evaluation of Interference Filters for Spectral Discrimination in Solution-Cathode Glow Discharge Optical Emission Spectrometry

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Electronic Supplementary Information

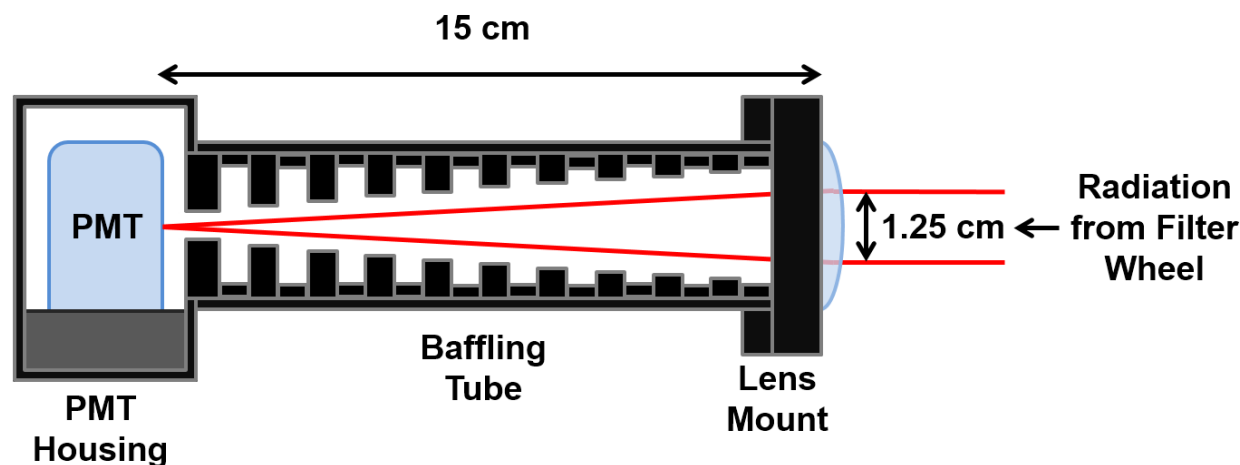


Figure 1. Schematic diagram of the baffling tube used to reduce stray radiation within the filter wheel instrument. In this design, the focusing lens was mounted to a 13.33-cm long aluminum tube (OD 2.77 cm, ID 2.45 cm), positioning it at a distance of 15 cm from the PMT (the focal length). Mounted within the tube was a series of twenty aluminum baffling rings, all with an outer diameter of 2.413 cm. Inner diameters of the rings varied; ten had an ID of 2.03 cm, while the remaining ten rings ranged in diameter from 0.25–1.85 cm, increasing in increments of 0.18-cm. When the 2.03-cm ID rings are placed alternating with rings of increasingly smaller diameter, a series of traps are created that prevent off-axis radiation from reaching the PMT.

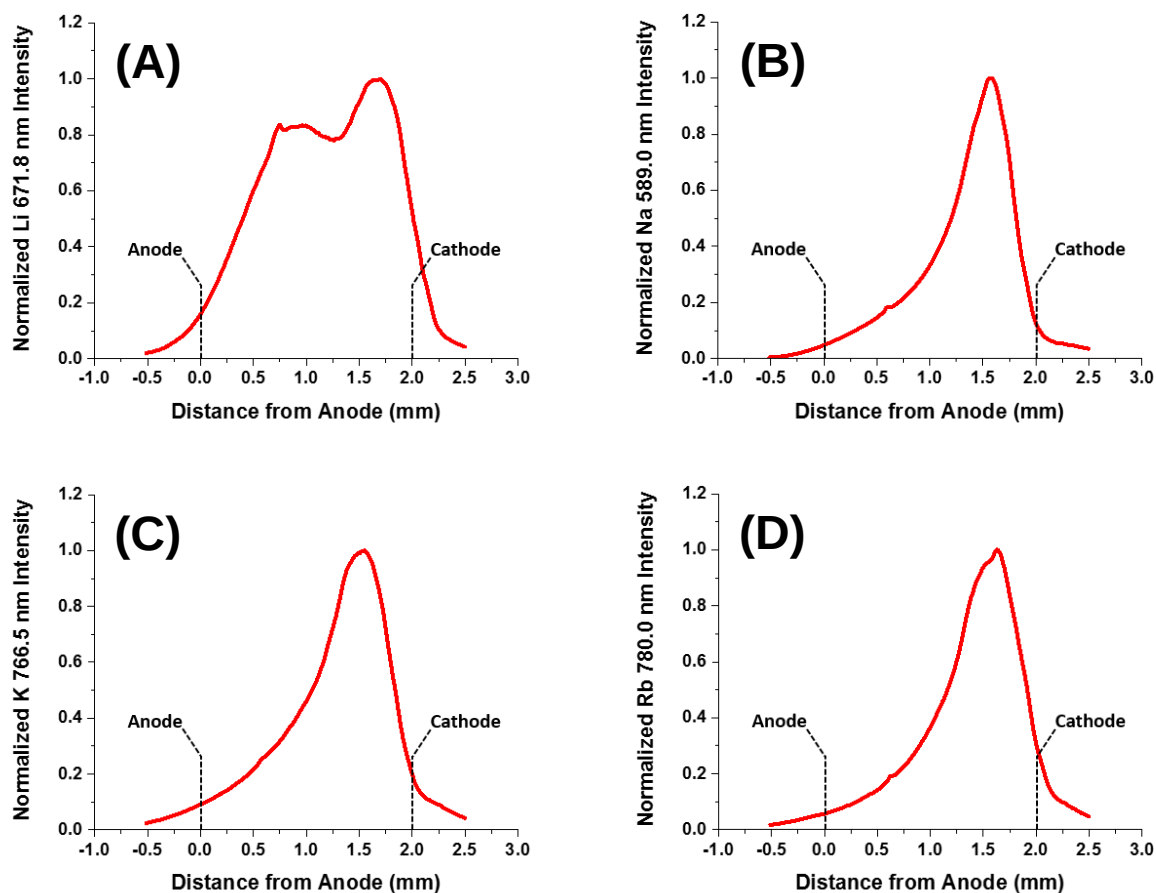


Figure 2. Vertical SCGD emission profiles for several analyte emission lines: (A) Li I 670.8 nm, (B) Na I 589.0 nm, (C) K I, 766.5 nm, (D) Rb I 780.0 nm. In these maps the anode is located a 0.0 mm on the x-axis and the cathode at 2.0 mm. Signal observed beyond the surface of the electrodes results from several factors. Most prominently, the discharge does not immediately terminate at the surface of either electrode, but rather sheaths around them. Also contributing are reflections and scattering off of the surfaces of both electrodes and chromatic aberrations that result in degraded focus.

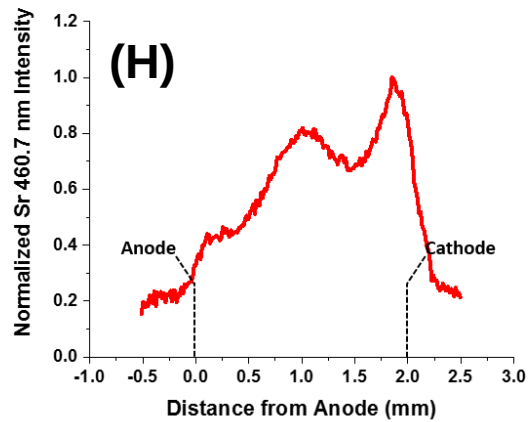
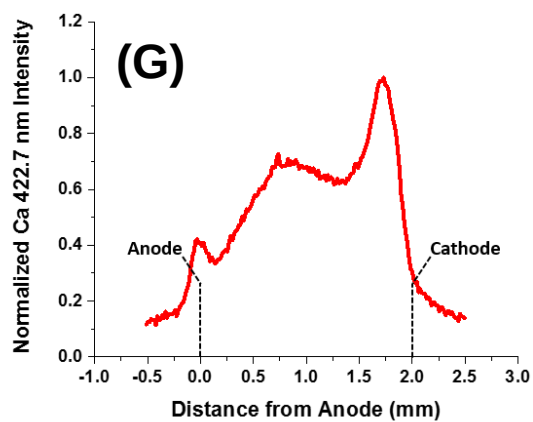
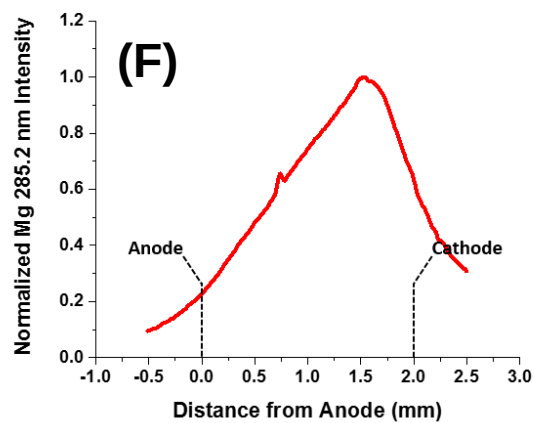
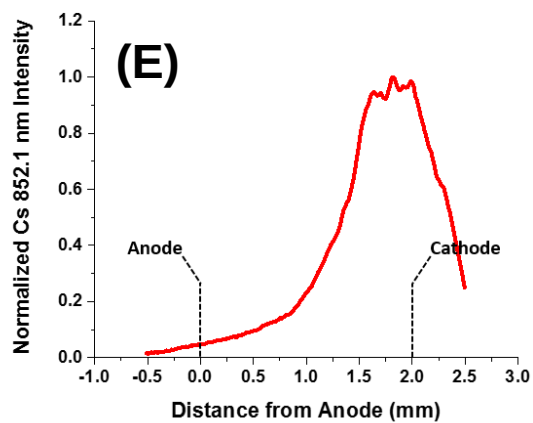


Figure 2. (cont.) Vertical emission profiles for (E) Cs I 852.1 nm, (F) Mg I 285.2 nm, (G) Ca I, 422.7 nm, (H) Sr I 460.7 nm.

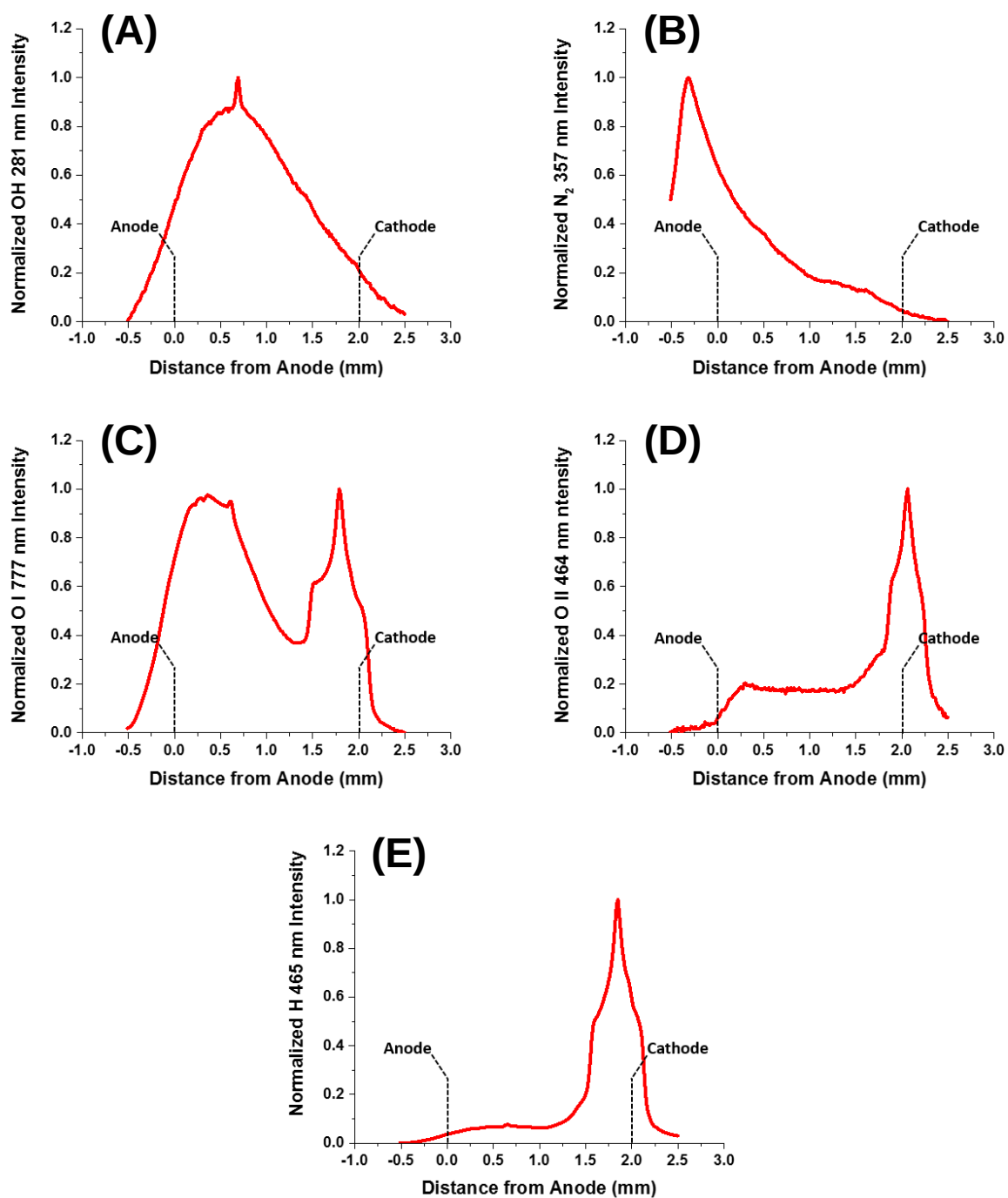


Figure 3. Vertical SCGD emission profiles for several background species: (A) OH^* 281.6 nm, (B) N_2 357.0 nm, (C) O I 777.2 nm, (D) O II 464.2 nm, and (E) H_β 486.1 nm.

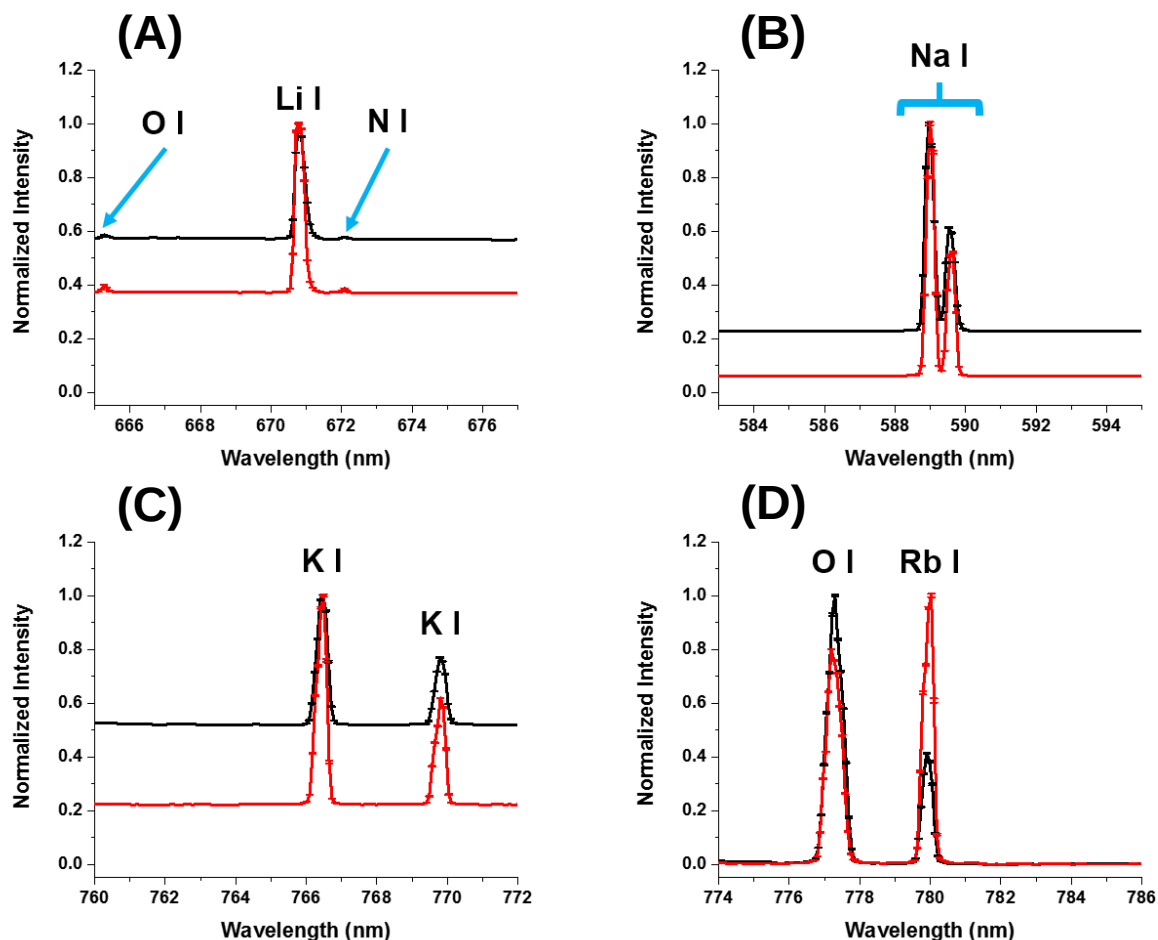


Figure 4. Effect of spatial selection on the spectral regions transmitted by the interference filters used for detection of (A) Li, (B) Na, (C) K, and (D) Rb (the respective filter passes the entire wavelength region shown in each spectrum). Black traces represent the spectra observed when emission is summed over the full vertical profile of the SCGD, while the red traces are for spectra when emission is summed from only a 75-μm tall region centered 0.5-mm above the cathode (solution) surface. Error bars correspond to the standard deviation produced from ten 10-s integrations of the signal over the spectral region of interest.

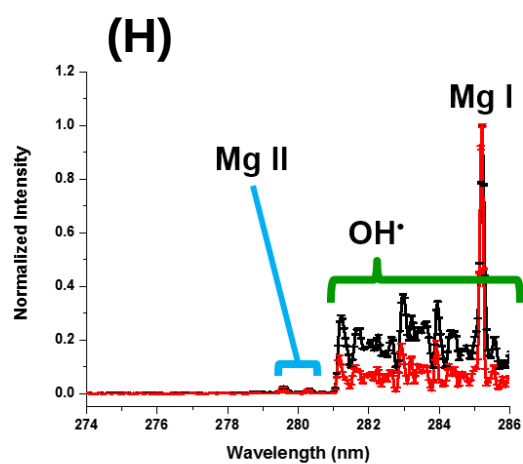
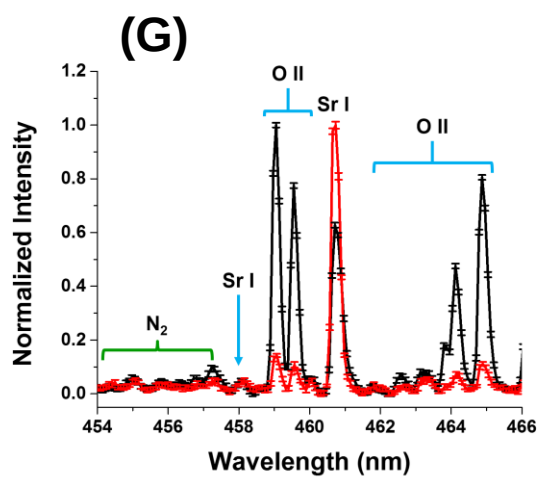
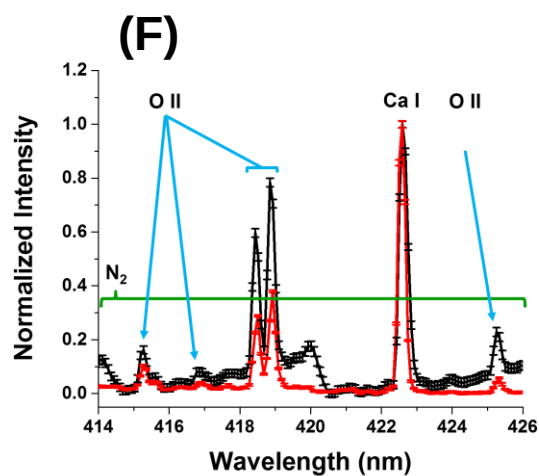
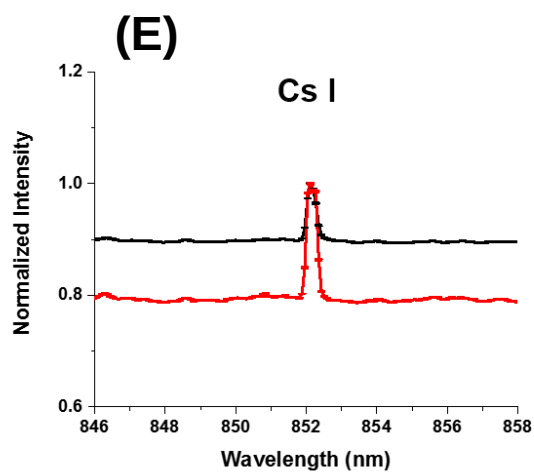


Figure 4. (cont.) Effect of spatial selection on the spectral regions transmitted by the interference filters used for detection of (E) Cs, (F) Ca, (G) Sr, and (H) Mg.