SEPARATION OF FLUORESCENT ORGANIC DYES AND SALTS BY CAPILLARY ELECTROPHORESIS TO INVESTIGATE THEIR BINDING PROPERTIES WITH METAL OXIDE NANOPARTICLES, NANOPLASTICS, CASEIN MICELLES, AND LIPOSOMES.

Edward P.C. Lai, Amos Onomhante. Carleton University, Department of Chemistry, 1125 Colonel By Dr, Ottawa, ON K1S 5B6, Canada. (edward.lai@carleton.ca)

The motivation for this work was to utilize capillary electrophoresis for the separation of organic dyes and salts in our investigation of their binding properties with various metal oxide nanoparticles, nanoplastics, casein micelles, or liposomes present in water samples. The free dyes/salts were separated from each other and the dye/salt-bound nanoparticles, thus eliminating any potential interference and guaranteeing high accuracy in the % binding determination. Our strategy was to use laser-induced fluorescence (LIF) for the detection of all dyes/salts, thus enabling high-throughput analysis for screening environmental water samples. Experimental results have been obtained in our lab that verify binding of rhodamine 6G dye and acridine orange salt with transition metal oxide nanoparticles, polystyrene nanospheres, casein micelles, and soy lecithin liposomes. Two diode lasers were operated at l_{ex} of 450 and 480 nm, together with interference filters collecting emission photons with l_{em} from 520 to 580 nm, to facilitate the simultaneous detection of several dyes/salts. The dual LIF detectors could be placed at two detection windows along the fused silica capillary, thus permitting flexible adjustment of the migration times for overlapped dye/salt peaks in the electropherogram. This analytical approach could potentially be expanded to employ multiple LIF detectors with fiber optics.