PhD Opportunity for APA/IPRS (or equivalent) applicants

Application of fluorescence probes for optimising coagulant and powdered activated doses at water treatment plants impacted by cyanobacteria blooms

School of Chemical Engineering/
School of Civil and Environmental Engineering /
Australian Water Quality Centre

An operating allowance and PhD top-up scholarship is available for a successful APA/IPRS applicant via ARC Linkage Grant LP130100033: On-line monitoring of cyanobacteria to predict coagulant doses and powdered activated carbon application in water treatment. Cyanobacteria are increasingly challenging the capability of drinking water and advanced wastewater treatment works to meet Australian drinking and recycled water guidelines due to the release of metabolites including cyanotoxins and taste and odour (T&O) compounds that adversely impact water quality. The two major barriers for cyanotoxins and T&O compounds in water treatment plants (WTPs) in Australia are powdered activated carbon (PAC) dosing and coagulation with alum or ferric salts. PAC dosing removes the dissolved, or extracellular, metabolites and coagulation removes the compounds contained within the cell, intracellular metabolites. The optimization of both processes in the presence of cyanobacteria relies on rapid determination of cell numbers and metabolite concentrations as cyanobacteria numbers at the inlet to the plant can vary on an hourly basis. However, the determination of optimum PAC and coagulant doses in the presence of cyanobacteria blooms is currently based on cell counts and T&O analysis that may take up to several days to obtain. Jar tests and measurements of filtered water turbidity are often undertaken on site to determine coagulant doses; however, these tests also provide data after the water has been released into the system. Water treatment operational staff and water quality managers have identified the need for a rapid, in situ and/or on-line monitor for cyanobacteria and associated metabolites to allow rapid, or instantaneous, adjustment of water treatment chemicals to ensure full compliance with water quality goals. The application of fluorescence probes appears to have great potential to fulfil this need; however, no studies have investigated the use of these probes to control PAC and coagulant doses based on estimations of toxin and T&O concentrations. This PhD project will therefore investigate the use of fluorescence probes to determine PAC and coagulant doses at water treatment plants.

The successful student will join the ARC Linkage project team that entails a substantial collaboration between the School of Chemical Engineering, School of Civil and Environmental Engineering, the Australian Water Quality Centre (SA Water, Adelaide), National Cheng Kung University (Taiwan) and a further six industry partners. The suitable candidate will have a background in environmental engineering. The candidate should have a demonstrated aptitude for undertaking laboratory work and an understanding of water treatment technologies. The candidate should have excellent communication skills and will be expected to interact regularly with industry partners. It is anticipated that the student will spend a significant time undertaking field work and will be expected to spend a proportion of their PhD (up to a year) working at the Australian Water Quality Centre. The student needs to be successful in securing their own primary scholarship via APA or IPRS schemes (or equivalent). A project top-up scholarship will be provided to bring the total scholarship to $30k/annum.

Further information on the project and scholarship on offer may be obtained from Dr Rita Henderson (email: r.henderson@unsw.edu.au). Applications for the scholarships (including a cover letter, academic transcript and CV) should be submitted to Dr Henderson, School of Chemical Engineering, University of New South Wales, Sydney NSW 2052.