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Novel nanohybrid materials for the effective removal of phosphates and nitrates from liquid effluents

Ela Eroglu (1,2), M. Haniff Wahid (3), Ramiz A. Boulos (3), Xianjue Chen (3), Paul K. Eggers (1), Jeremiah Toster (1), Nicholas J. D'Alonzo (1), Steven M. Smith (2), and Colin L. Raston (3)

(1) Centre for Strategic Nano-Fabrication, School of Chemistry and Biochemistry, The University of Western Australia, Crawley, WA 6009, Australia (elaeroglu@gmail.com), (2) ARC Centre of Excellence in Plant Energy Biology, The University of Western Australia, Crawley, WA 6009, Australia, (3) School of Chemical and Physical Sciences, Flinders University, Bedford Park, South Australia 5042, Australia

Within our research group, various types of nanofabrication processes have been applied for creating novel nanohybrid materials, including the immobilization of some microorganisms with electrospun nanofibres[1], laminar nanomaterials (i.e. graphene and graphene oxide)[2,3], microfibers of human hair[4], and magnetic nanoparticles impregnated in polymer[5]. These approaches afford nanohybrid materials with microalgal cells[1−5] or diatom frustules[6] for the removal of waste pollutants, mainly nitrate and phosphate ions, while establishing a new paradigm in the field. Aside from these immobilization studies, we also investigated the improvement of nitrate removal with exfoliated graphene sheets in the presence of p-phosphonic acid calix[8]arene molecules.[7] Various material characterization techniques such as scanning electron microscopy, transmission electron microscopy, atomic force microscopy, and Raman spectroscopy were used for the characterization of the novel nanohybrid materials, while fluorescence microscopy and chlorophyll content analysis were mainly used for monitoring the viability and growth pattern of the microalgal cells. Nitrate and phosphate analyses were carried out by following HACH® standard methods. In this talk, a brief overview of the fabrication processes of these nanohybrid materials and their application for wastewater treatment will be highlighted.

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