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Removal of nitrate from liquid effluents with bio-nano hybrid materials

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Microalgae are a group of microorganisms that are abundant in the environment and have been commonly used as a tool for sustainable green technologies including bioenergy production[1,2], CO_2 sequestration[2], wastewater treatment[3,4], and nutritional supplement[5]. We have recently developed a hybridization process between common microalgal cells (*Chlorella vulgaris*) and multi-layer graphene sheets[4]. Graphene has very strong adhesion energies[6] with an ability to attach on the surface of microalgal cells, which results in a functional hybrid material. Initially dynamic thin films formed within a microfluidic platform, as a vortex fluidic device, were used to exfoliate multi-layer graphene from graphite flakes in water. This was followed by hybridizing the multi-layer graphene with microalgal cells. The resulting bio-nano hybrid material was particularly efficient for the removal of nitrate from liquid effluents without being toxic for the microalgal cells. Scanning electron microscopy, transmission electron microscopy, atomic force microscopy, and Raman spectroscopy techniques were used for the characterization of the formed graphene sheets, with the fluorescence microscopy and chlorophyll content analyzed for monitoring the viability and growth pattern of the microalgal cells.

1. E. Eroglu and A. Melis, Biotechnol. Bioeng., 2009, 102(5), 1406-1415.
2. É. C Francisco, D. B. Neves, E. Jacob-Lopes, and T. T. Franco, J. Chem. Technol. Biotechnol., 2010, 85, 395-403.
3. E. Eroglu, V. Agarwal, M. Bradshaw, X. Chen, S.M. Smith, C.L. Raston and K.S. Iyer, Green Chem., 2012, 14(10), 2682 - 2685.
4. M. H. Wahid, E. Eroglu, X. Chen, S.M. Smith, and C.L. Raston, Green Chem., 2012, doi:10.1039/C2GC36892G.
5. P. Spolaore, C. Joannis-Cassan, E. Duran and A. Isambert, J. Biosci. Bioeng., 2006, 101, 87-96.
6. S. P. Koenig, N. G. Boddeti, M. L. Dunn and J. S. Bunch, Nat. Nanotechnol., 2011, 6, 543-546.