Synergistic degradation of dyes with marine bacteria incubated in graphene oxide matrix

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Graphene or graphene-based nanomaterials have emerged as novel scaffolds for developing robust bio-catalytic systems and a fast-developing promising contender for bioremediation. The interaction of bacteria and graphene is such an elusive issue that its implication in environmental biotechnology is unclear. The complexity and recalcitrant nature of the dyes make the conventional techniques inadequate and remain a challenge for industrial effluent treatment. Many scientists have developed hybrid processes and hybrid materials to enhance the treatment processes to satisfy increasingly stringent laws and criteria related to effluent discharge. The current study explicitly focuses on immobilization and growth of dye-degrading marine bacterial isolates on graphene oxide and their application in methylene blue dye degradation. The synergistic effects of adsorption and biodegradation achieved a unique clean-up performance that the counterpart-free bacteria could not fulfill. Further, toxicity analysis of intermediates also confirmed the non-toxic nature of the intermediates formed after synergistic treatment. This work has the potential to lead to zero effluent treatment processes.