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Nanomaterials induced Micro/Nanoplastic Removal from Aquatic/Land Environment

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Abstract: The rapid urbanization modulates common people to use plastics in their daily lives that dangerously posing threats to surrounding environment in form of land, water pollution and also disturb the beautification of society. The most eclectic used plastics model are, polystyrene (PS), polyethylene, polypropylene, poly(vinylchloride), and poly(ethylene terephthalate. The degradation of these macro plastics yields tiny fragments having size ranges from 5mm to 1μm and evenly in nanometer range. These secondary and tertiary plastics are framed as microplastics (MP) and nanoplastics(NP) respectively. MP contains marine waste at about 75% of total mass, that is responsible for 80-90% land pollution and 10— 20% aquatic pollution. Thus the removal of MP/NP are of prime concern in today's digital life to develop sustainable society. Nanomaterials are well characterized by their higher surface energy, astonishing surface properties and unique physico-chemical characteristics. The light responsive nanomaterials especially metal oxides are capable of generating reactive oxygen species(ROS) that is thought to be promising agent for degradation and catalytic activities. So, nanomaterial based approach may be thought as bold and assertive solution of this problem. In this context, we outlined respective sources, toxicity and nanomaterials based different solutions. In this context, our focus is on the light responsive metal oxide nanoparticles. The speciality of this review is to explore ROS mediated nanomaterial induced MP/NP eradication by thoroughly discussion of ROS production and their interaction with MP/NP. Three types of eradication exist such as sorption, photocatalysis and membrane technology. Herein, we attempted to unveil sorption and light responsive catalytic phenomena for removal of hazardous MP/NP. Also light responsive micromotor based approach was highlighted. Finally current challenges to remove MPs/NPs are addressed. This present review will be useful for researchers working in this domain for better developing nanomaterials for MP/NP eradication.