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Adsorption of Nanoplastics on Algal Photosynthesis[1] JAMES TURNER , Department of Physics and Astronomy, Clemson University , PRIYANKA BHATTACHARYA , Department of Physics and Astronomy, COMSET, Clemson University , SIJIE LIN , Department of Physics and Astronomy, Clemson University , PU CHUN KE, Department of Physics and Astronomy, COMSET, Clemson University — The rapid accumulation of disposed plastics in the environment, especially in the Pacific Ocean, has become a global concern in recent years. Photo, chemical and physical degradations constantly fragment these plastics into a wide array of macroscopic to microscopic particles. As a result, marine organisms such as algae may be exposed to plastic particles through ingestion, adsorption and other forms of uptake. Such interactions, currently little understood, could potentially impact on the health state of the entire food chain. Here we report on polystyrene-algae interaction and its impact on algal photosynthesis. We first investigated the adsorption of polystyrene beads (20 nm) on a cellulose film coated on a 96-well plate. We derived a supralinear increase of the adsorption with the beads concentration for both positively and negatively charged polystyrene beads, with a saturation observed for the negatively charged polystyrene beads of concentration above 1.6 mg/mL. Using a bicarbonate indicator we discovered decreased carbon dioxide depletion due to polystyrene-algae binding. Since polystyrene beads also mediated algae aggregation, nanoplastics may alternatively be harnessed for waste water treatment.

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