

Abstract Submitted
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Harnessing passive cilia arrays in ambient flow for anti-biofouling applications ANURAG TRIPATHI, Dept. of Chemical and Petroleum Engineering, University of Pittsburgh, AMITABH BHATTACHARYA, Dept. of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, ANNA BALAZS, Dept. of Chemical and Petroleum Engineering, University of Pittsburgh — Active cilia arrays have been predicted to propel adhesive particles away from the surface and hence, could be used for antibiofouling applications (Bhattacharya et.al. Langmuir, 2012, 28, 3217). We explore the possibility of using non-actuated, passive cilia arrays for antibiofouling applications by utilizing the arrays' response to the ambient flow conditions. Using a hybrid computational model, we simulate a sticky biofouling spherical particle moving (under the influence of an applied force) towards the ciliated surface in an ambient fluid medium. Shear flow between parallel walls was simulated to mimic the ambient fluid flow dislodging the sticky particle from the surface. We obtain the minimum shear required to propel the sticky particle from the ciliated surface for different stickiness of the biofouling particle and stiffness of the cilia. The results are contrasted with adhesion to flat, non-ciliated surfaces and the important role of the cilia's response to the ambient flow condition is emphasized.

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