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A Bioengineered Memory Device using Bacteriorhodopsin and Graphene. ROMA PATEL, AMANDA PETRUS, ISAAC MACWAN, University of Bridgeport — Bacteriorhodopsin (BR) is a photoactive protein, which has been studied as a memory storage device owing to its photochemical and thermal stability. BR photocycle comprises of two distinct stable binary states, bR (0) and Q (1) based on the wavelength of the applied radiation. However, such devices have a limited success due to low quantum yield of the Q state. Many studies have used genetic and chemical modification as optimization strategies to increase the yield of the Q state compromising the overall photochemical stability. Here we come up with a unique way of stabilizing this BR and Q states through its adsorption onto graphene. We have used all-atom molecular dynamics (MD) simulations utilizing NAMD and the CHARMM force field to understand the interactive events at the interface of BR and a single layer graphene sheet. Based on the stable RMSD and interactive energies such as van der Waals and electrostatics, we propose that the adsorption of BR onto graphene can stabilize the photochemical behavior of BR. Furthermore, the switching between Cis and Trans conformations of the retinal based on the angular change of the dihedral demonstrates that such an adsorption is beneficial to preserve the binary states.

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