Graphene-based adaptive optics

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In nature, adaptive coloration has been used for concealment and signaling. Various biological mechanisms have evolved to tune the reflectivity of visible and ultraviolet light. In modern technology, however, there are a limited number of active materials that can be used to develop surfaces with reconfigurable reflectance and transmittance in a very broad spectral window. Graphene provides new perspective for "smart" surfaces which can enable new technologies such as active radar shields to conceal objects from radar detection or flexible display devices for optical camouflage. The ability to control interaction of electromagnetic waves with matter forms the heart of these emerging applications.

In this talk, I will summarize our recent work on graphene-based adaptive surfaces operating in a very broad spectrum covering from the visible to microwave. Our method relies on electro-modulation of interband and intraband electronic transition of large-area single and multilayer graphene in various device architectures. Based on this principle, we developed new class of adaptive surfaces capable of real-time electrical-control of its appearance. I will also talk about integration of possible feedback systems which allow us to realize adaptive camouflage systems that can sense the time-varying background and change the appearance to bend itself in the background.