Most electrochemical graphene-based sensors are realized on insulating materials to avoid a contribution from the supporting substrate on the electrochemical response.[1] Here, we show that the choice of insulating substrate plays a significant role on the electrochemical response. We find that the kinetics as well as the reversibility of the reduction and oxidation of classical redox probes is dictated by solution pH.[2] We attribute this phenomenon to specific interactions between the supported graphene monolayer and the redox probe itself. Additionally, the electrochemistry further depends on the kind of substrate.[3] This behavior is attributed to different amounts of ionizable groups at the supported graphene-liquid-interface.[4] This finding will have a great impact in designing graphene-based electrochemical (bio-)sensors.

References


Figure 1: The pH-dependence of the electrochemistry of ferri-/ferrocyanide couple on supported monolayer graphene. By changing the solution pH from 2 to 7, the redox reversibility of the ferri-/ferrocyanide couple is lowered due to specific interactions between the redox probe and the supported graphene-liquid interface.