

Measuring Electrostatic Potential at Atomic Resolution with Electron Paramagnetic Resonance

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The ability to measure the electrostatic potential directly at a spectroscopic label can provide important information about the flow of energy through motor proteins like myosin as a function of their state hydrolysis and state of binding with other proteins. We have recently calibrated a set of charged paramagnetic relaxation agents which allow us to de-embed the electrostatic potential from accessibility measurements made with electron paramagnetic resonance (EPR) (Surek JMR 190, pp7-25). We have applied this set to the myosin motor domain at specific labeling sites (in preparation) with results that demonstrate the importance of transmitted electrostatic potential changes to proteins which undergo large reversible conformations as they function. The technique may be generally applied to any molecule which bears an unpaired organic electron spin or that can be labeled with a nitroxide spin label.