

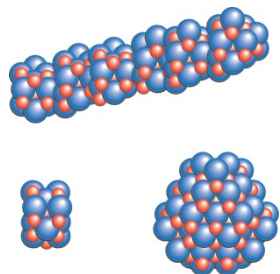
Electrochemical Sensors for Toxicity of Nanoparticles: First Steps

Felice C. Simeone

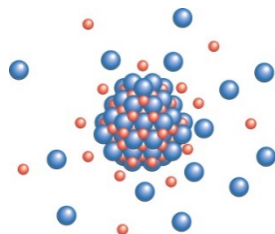
National Research Council of Italy

felice.simeone@istec.cnr.it

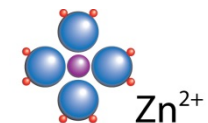
**Redox Processes:
Generate Radicals**



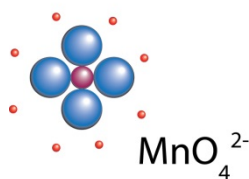
Size. Shape.



Dissolution

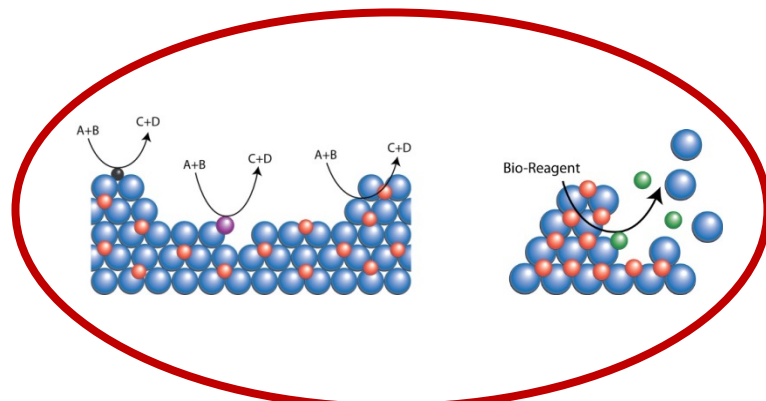


Zn^{2+}



MnO_4^{2-}

Hydrolysis

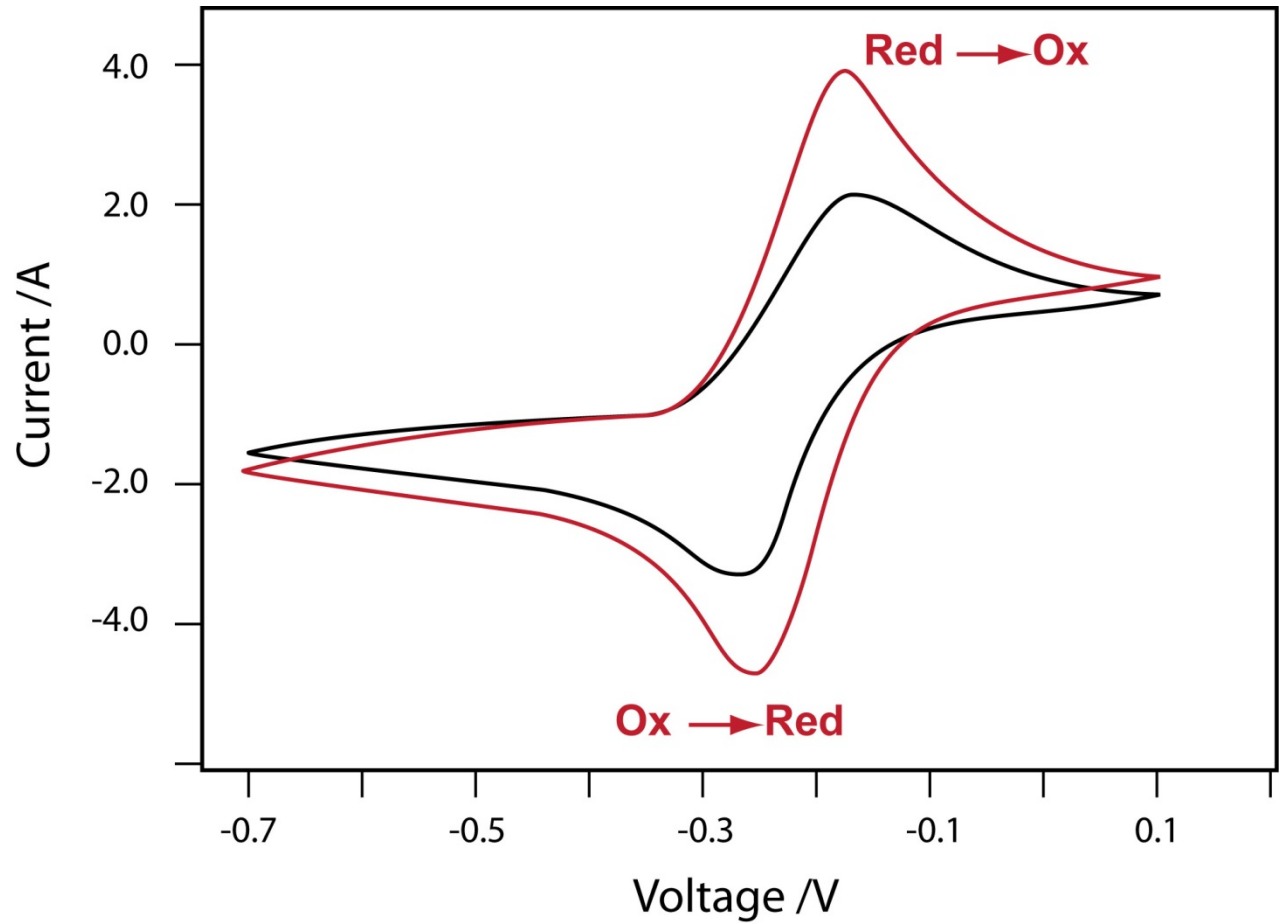
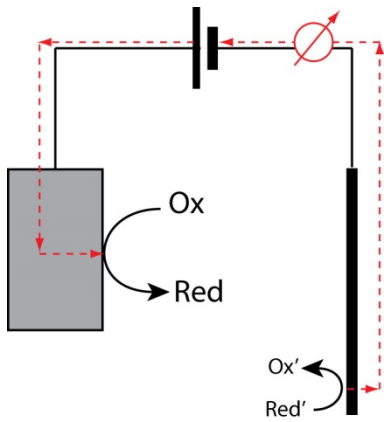
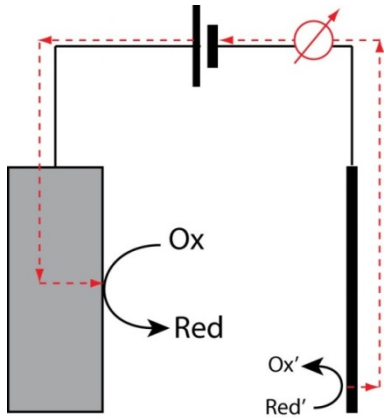


Surface reactivity

Bulk reactivity

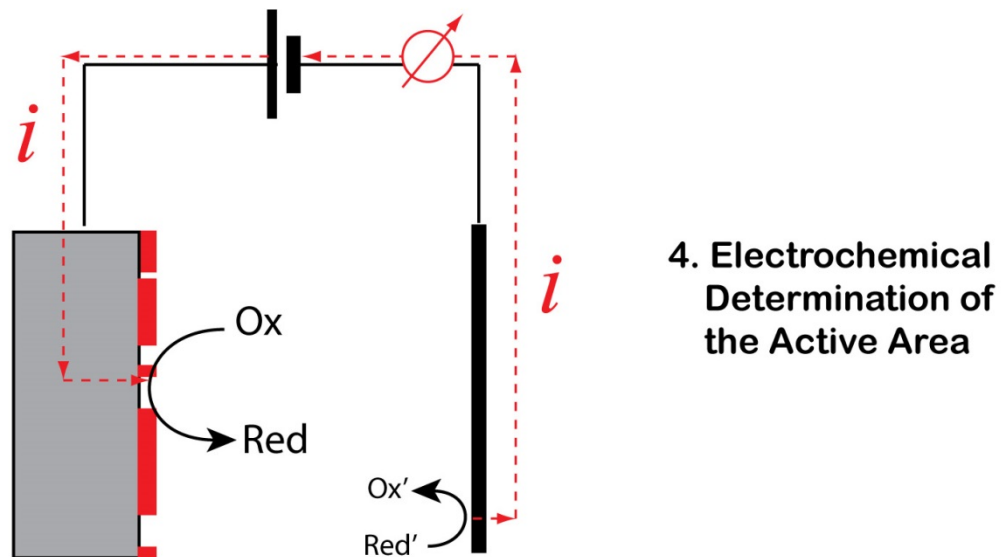
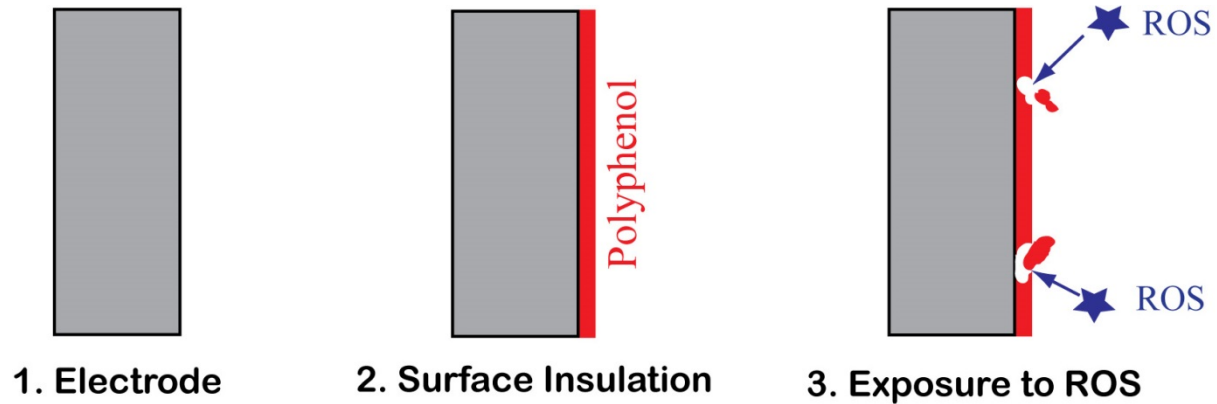
Hazard

Electrochemical Sensing

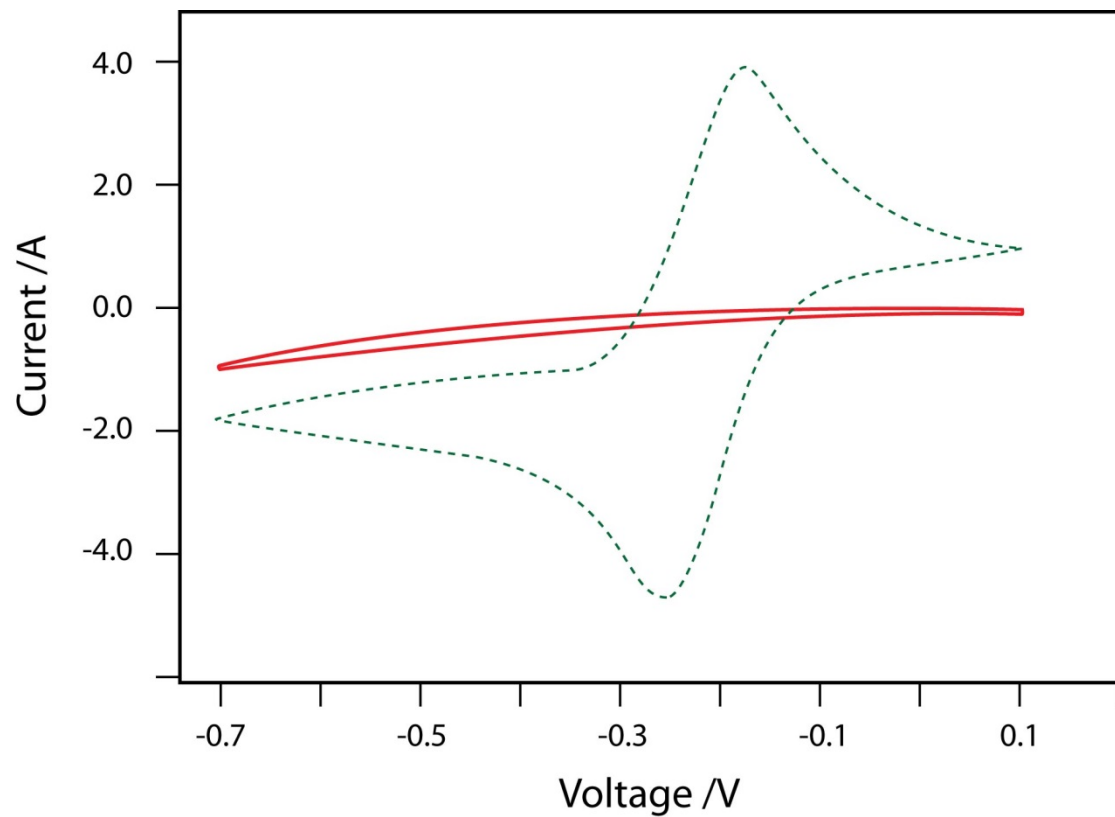
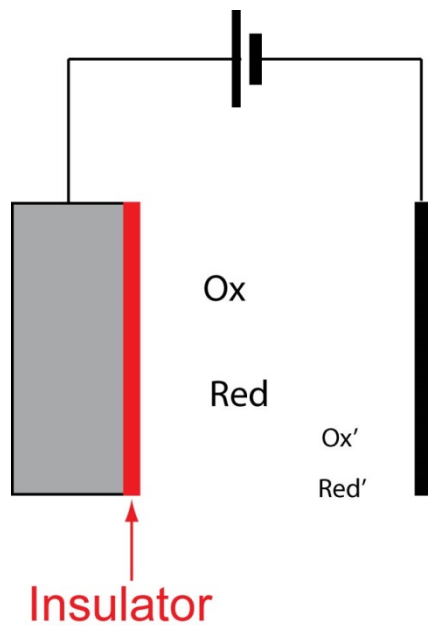


Electrochemical Sensing of Radicals (ROS)

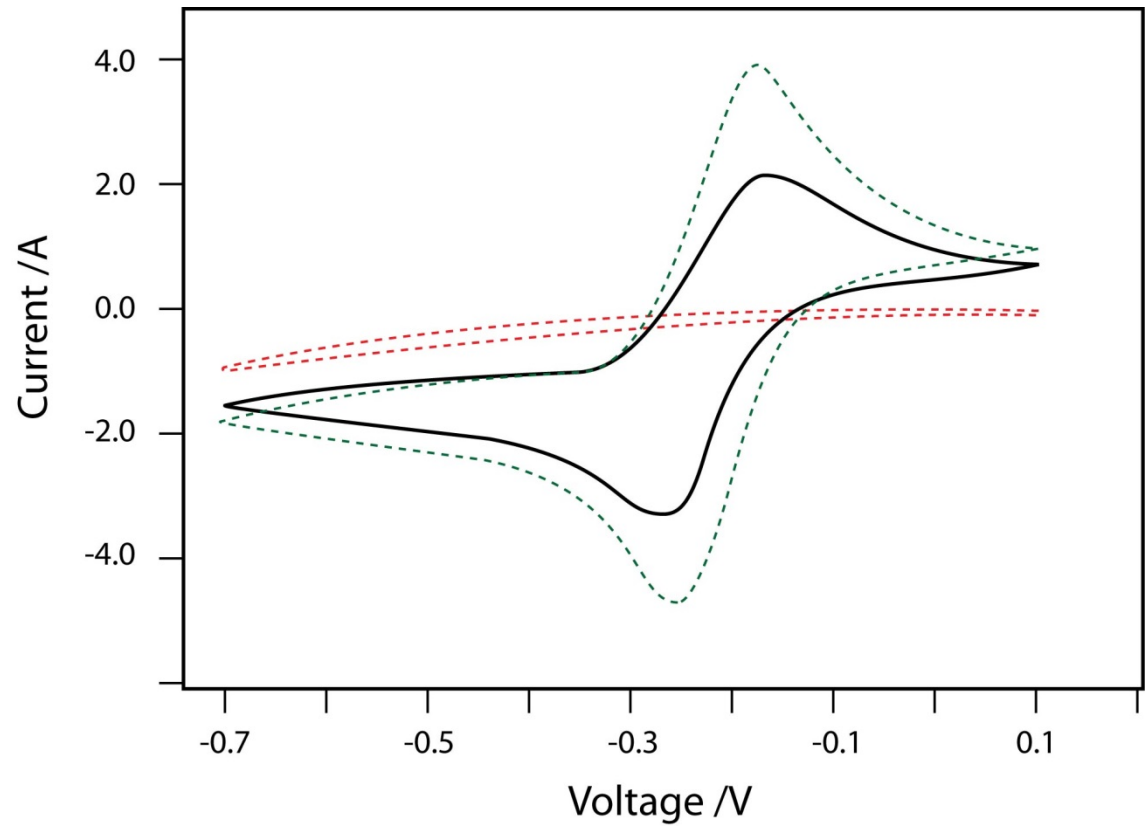
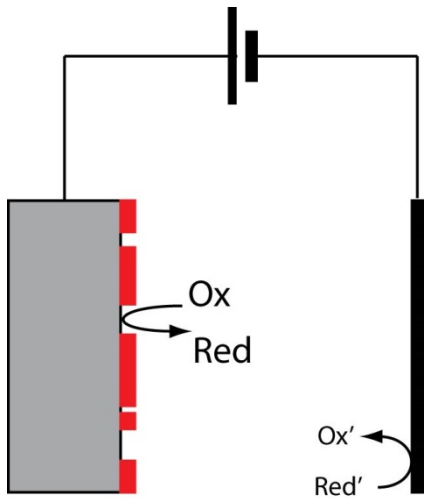
(ROS = Reactive Oxygen Species)



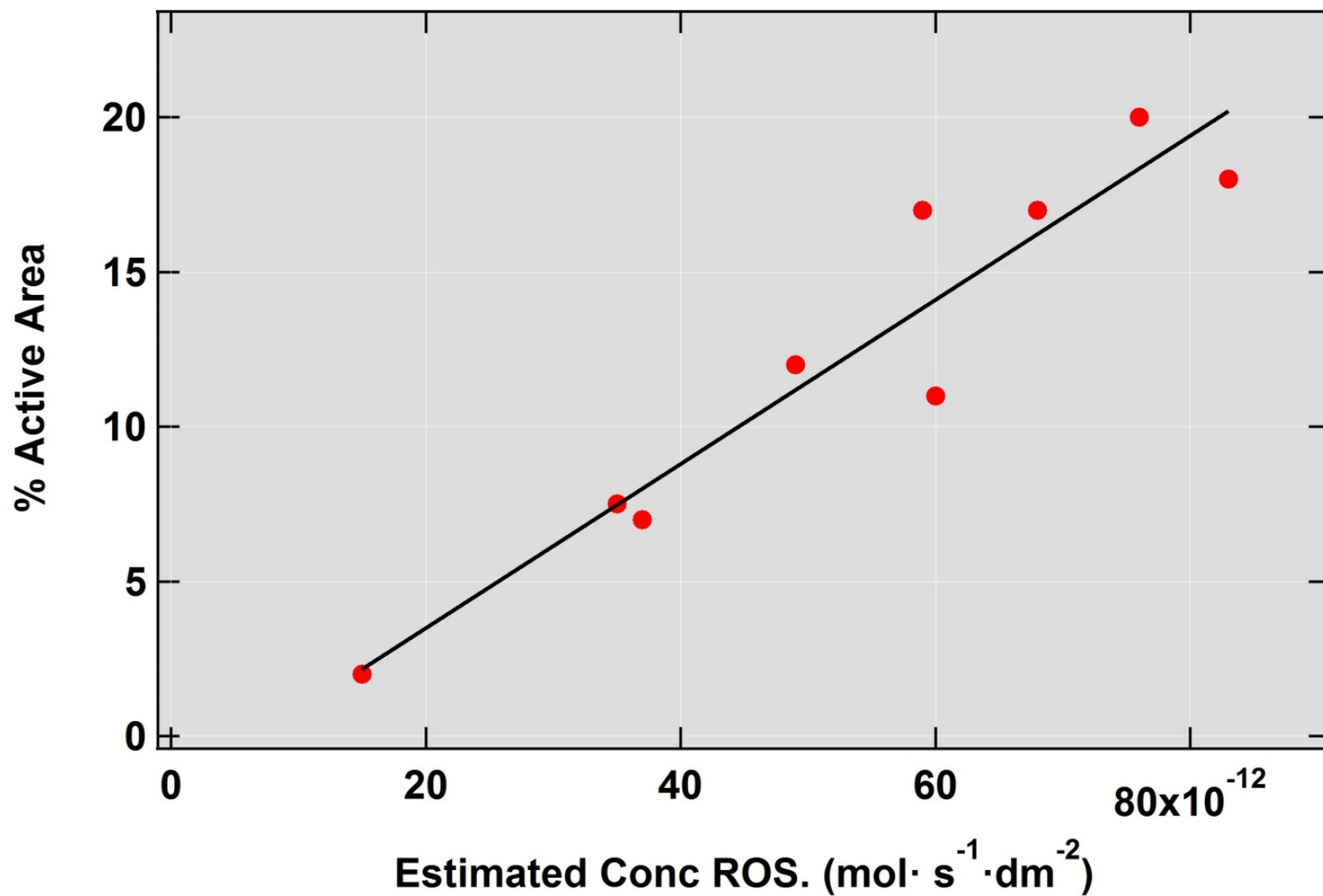
An Insulating Film Inhibits Electrochemical Current



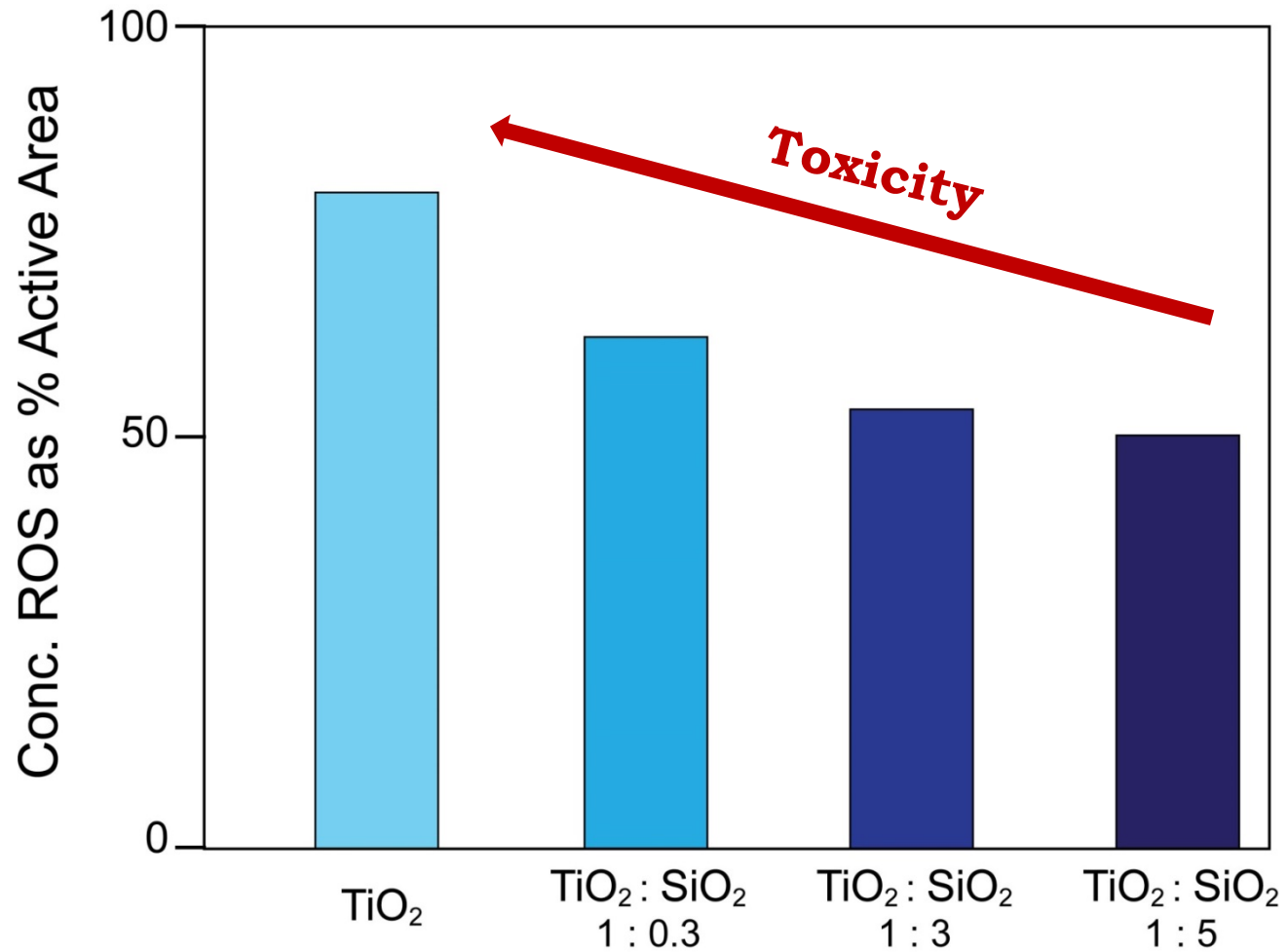
Charge Proportional to Conductive Area



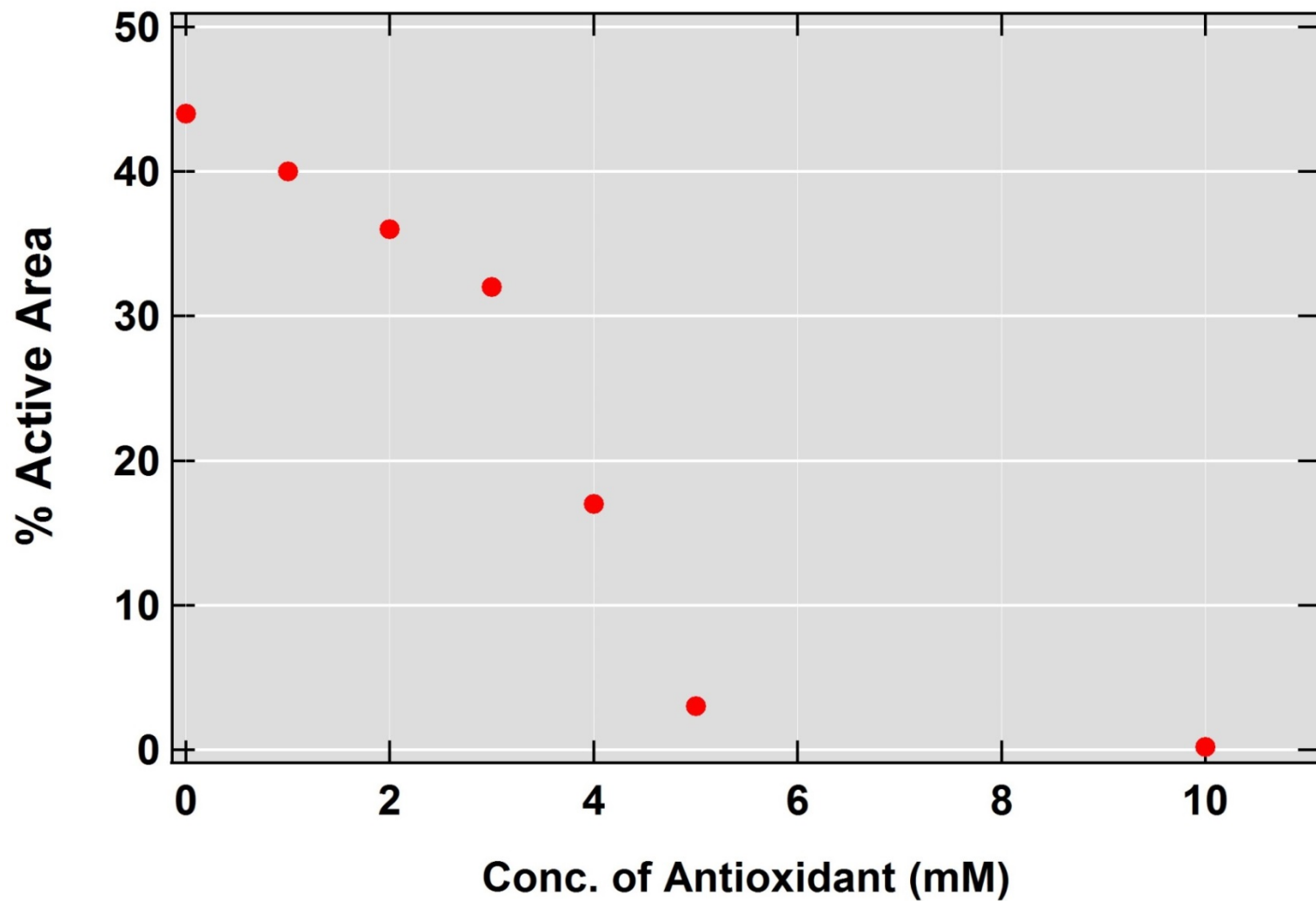
Conductive Area Proportional to Amount of Radicals



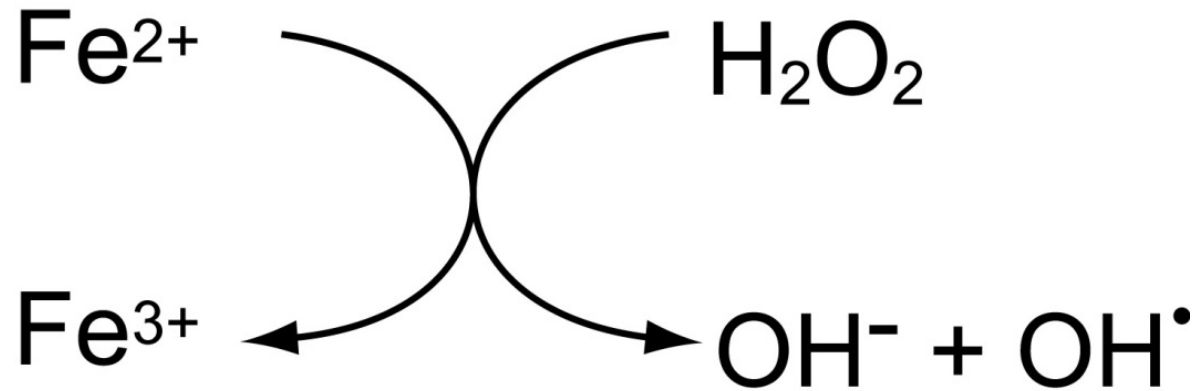
Production of Radicals by Photoactive Nanoparticles



Antioxidants neutralize radicals

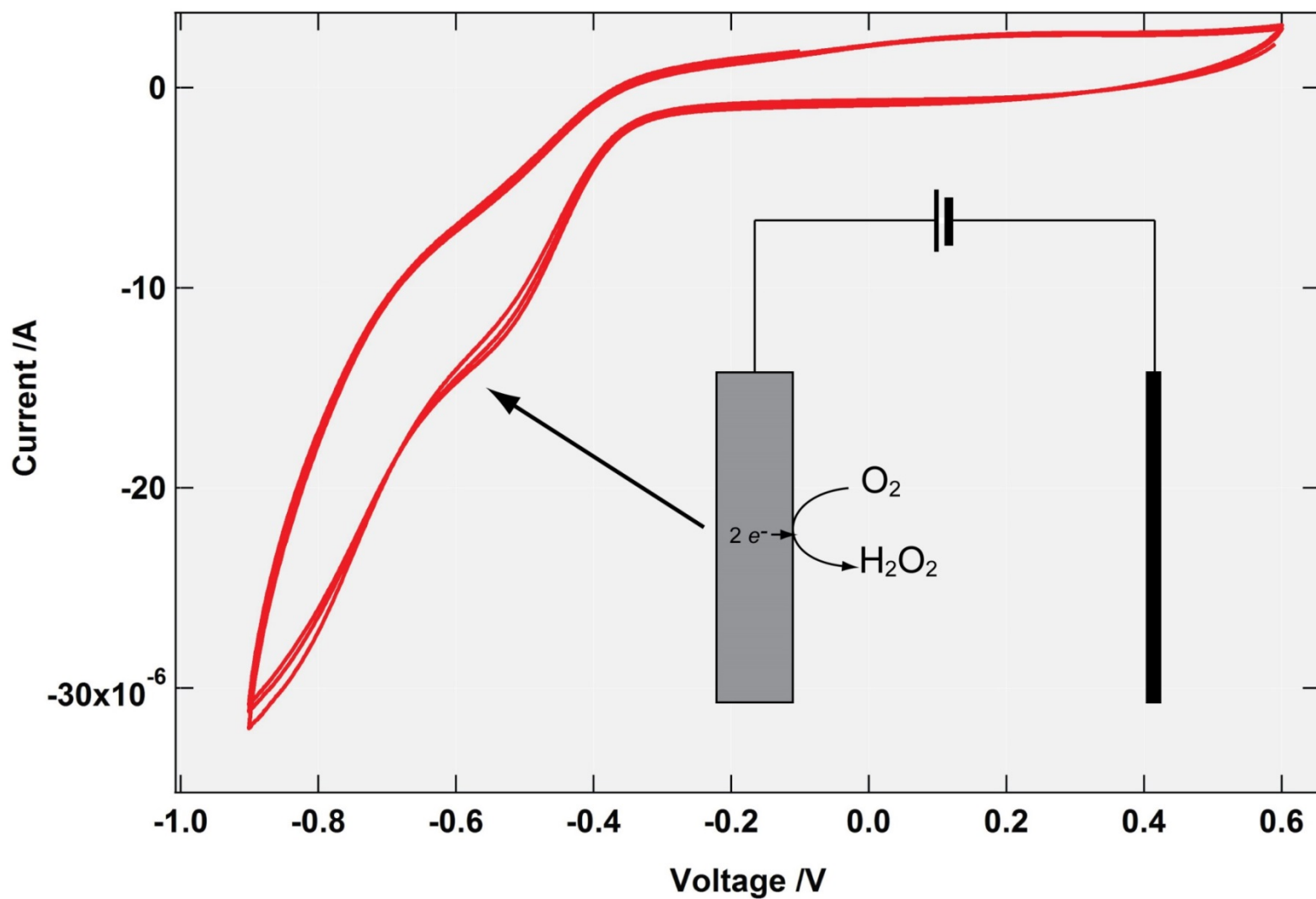


Sensing Redox Generation of Radicals

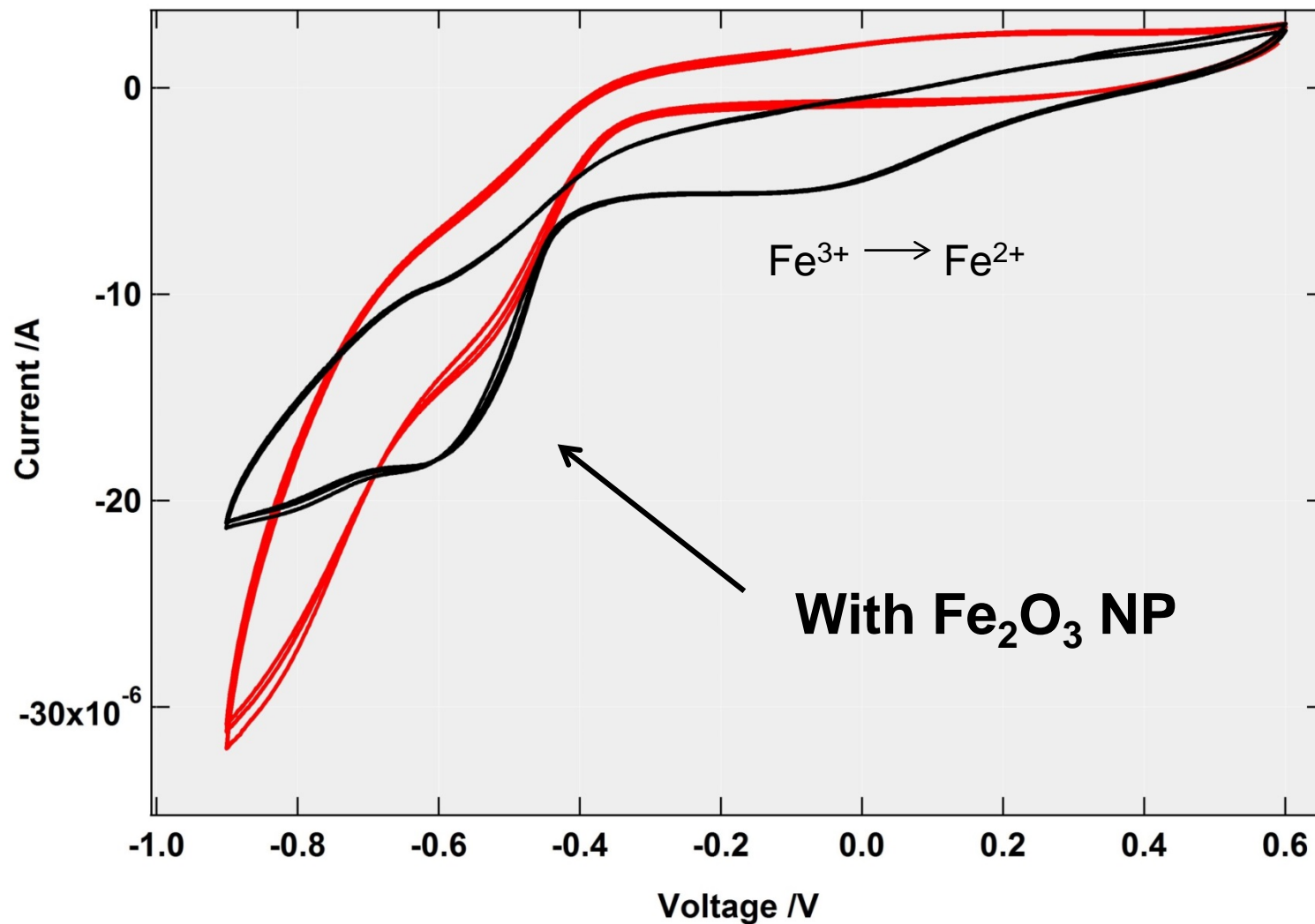


Fenton reaction
(first step of many others...)

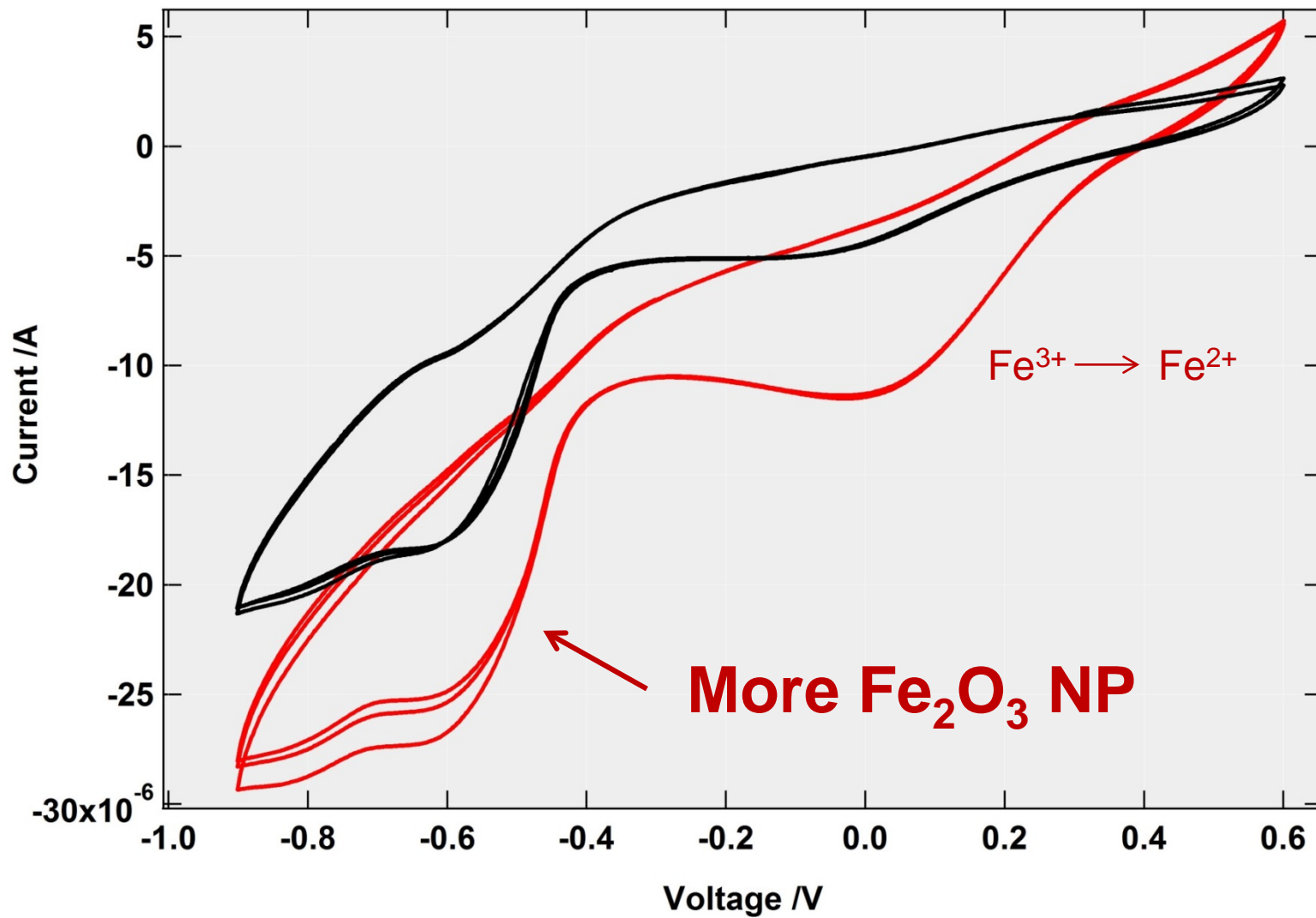
Electrochemical Reduction of Oxygen Generates Hydrogen Peroxide



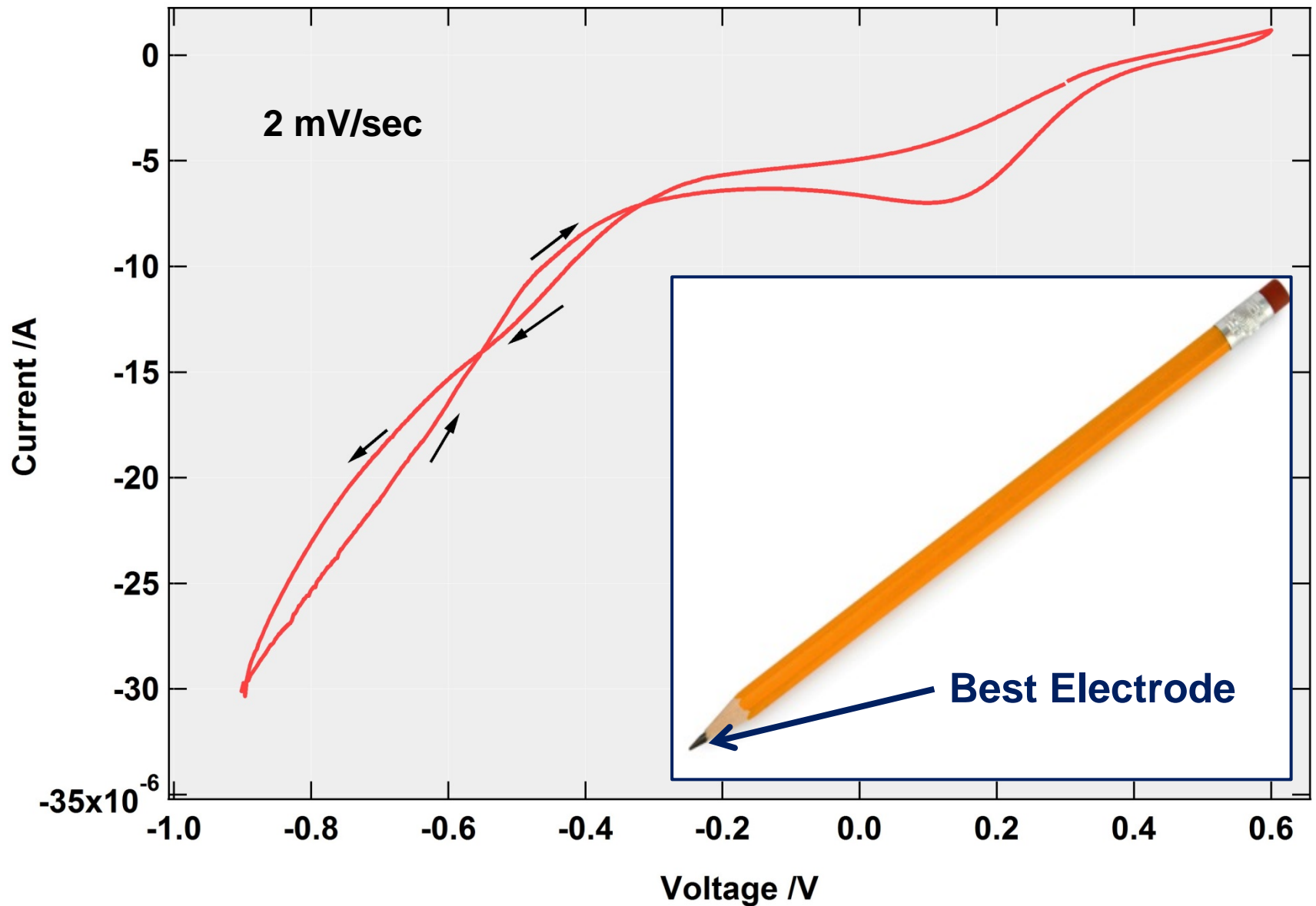
Fe_2O_3 Nanoparticles Change the Electrochemical Response

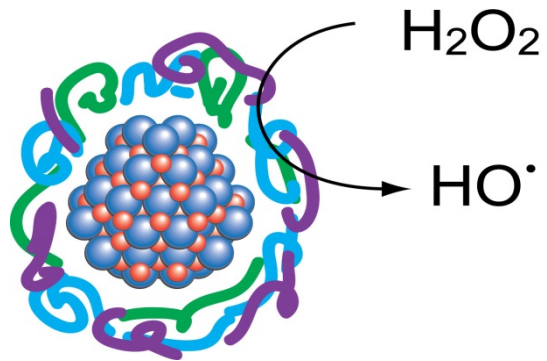


Response Changes with the Amount of Nanoparticles

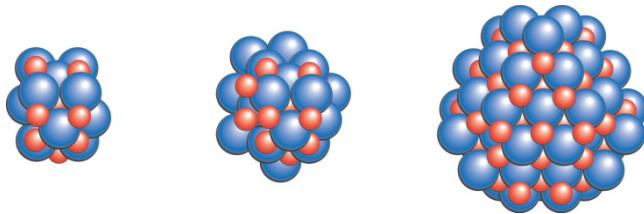


Response Changes with the Scan Rate of Voltage

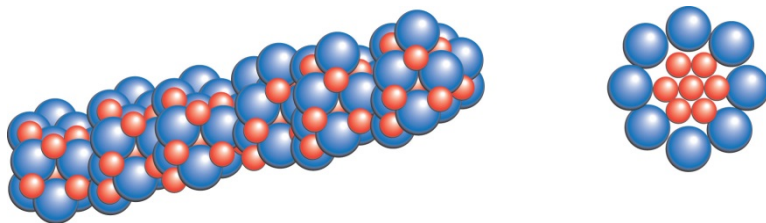




Effects of bio-corona?



Effects of size?



Effects of structure?

Acknowledgments



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