Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Exploring the Electrical Conductivity of Cytochrome P450 by Nano-Electrode and Conductive Atomic Force Microscopy[1] DEBIN LI, JIANHUA GU, YEWHEE CHYE, DAVID LEDERMAN, Dept of Physics, West Virginia University, JAROD KABULSKI, PETER GANNETT, Basic Pharmaceutical Sciences, West Virginia University, TIMOTHY TRACY, Dept of Experimental and Clinical Pharmacology, University of Minnesota — There is a growing interest in measuring the conductivity of electron-transfer proteins. The cytochrome P450 (CP450) enzymes represent an important class of heme-containing enzymes. Immobilizing CP450 enzymes on a surface can be used for studying a single enzyme with respect to electron transfer. The spin state of the heme iron can change upon binding of a substrate. In our experiment, CP450 (diameter $\sim$ 5 nm) has been bonded to a metal surface. Nano-electrodes (gap $<$ 10 nm) were fabricated by defining a bridge via e-beam lithography and then breaking the junction by electromigration at low temperatures. We have examined the electronic properties of CP450 by itself and after binding CP450 with flurbiprofen. The room temperature I-V conductivity is reminiscent to cyclic voltammetry measurements, indicating the presence of strong ionic transfer. At lower temperatures (100 K) the I-V characteristics indicate electronic transport dominated by tunneling processes. The conductive AFM is an additional method used to examine the enzyme's electronic properties. The results from two methods will be discussed..

[1]Supported by the West Virginia University WVNano Initiative.

David Lederman
West Virginia University

Date submitted: 30 Nov 2005 Electronic form version 1.4