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Hot Electron Attenuation Length Measurements of Cu and Ag using BEEM JOHN GARRAMONE, JOSEPH ABEL, ILONA SITNITSKY, University at Albany, LAI ZHAO, IAN APPELBAUM, University of Maryland, VINCENT LABELLA, University at Albany — Understanding electron transport and scattering in nanoscale Cu and Ag structures is important for modern integrated circuit technology and futuristic applications such as spintronics and hydrogen sensing [1,2]. In this study we will report on hot electron attenuation length measurements of nanometer thick films of Cu and Ag on the Si substrate utilizing ballistic electron emission microscopy (BEEM). BEEM is a three terminal scanning tunneling microcopy (STM) based technique where electrons are injected from a STM tip into a grounded metal base of a Schottky diode. The electrons that transverse the metal overlayer and surmount the Schottky barrier are measured as the BEEM current by a backside contact to the semiconductor. The attenuation length is extracted by measuring the falloff in BEEM current as a function of metal film thickness. The hot electron attenuation length for Cu of 33.4 ± 2.9 nm is measured at a tip bias of 1.0 eV and a temperature of 80 K. Results for Ag will also be presented as well as models used to extract the relative contribution of elastic and inelastic electron scattering in the metal films as a function of electron energy.

[1]Huang et al., Rev. Lett. 99 177209 (2007)
[2]Nienhaus et at., Appl. Phys. Lett. 74 4046 (1999)

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