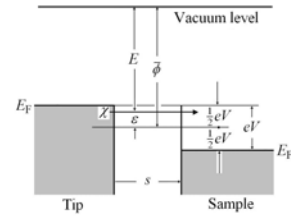


Spring 2008 MSAE E4990y
Introduction to STM and AFM

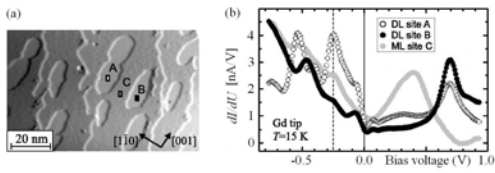
Lecture 23
Scanning Tunneling Spectroscopy

Three Cases



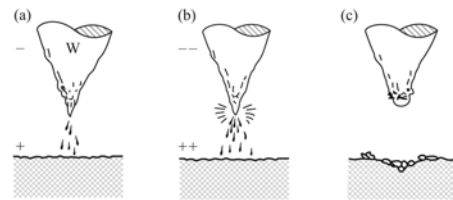
- (1) For small bias voltages, the variation of $|M|$ with voltage is negligible.
- (2) For large positive bias voltages, the sample DOS dominates.
- (3) For large negative bias voltages, the tip DOS dominates.

Scanning Tunneling Spectroscopy at Large Biases



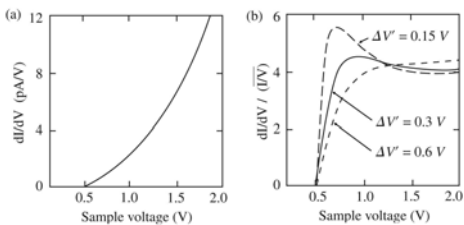
- (1) For large positive bias voltages, the sample DOS dominates.
- (2) For large negative bias voltages, the tip DOS dominates.
- (3) Upon a change of the tip, while the features on the positive side remain unchanged, the features at negative bias shows dramatic differences.
- (4) For details see pages 54-57, 332-334.

Tip Treatment for Scanning Tunneling Spectroscopy



- (1) By applying a field-emission current to partially melt the tip end, followed by recrystallization, a tip with relatively flat DOS is generated.
- (2) By touching the tip with a free-electron-metal sample, the tip picks up a cluster of free-electron-metal, and the tip DOS is relatively flat.

The Feenstra Parameter



- (1) To make the band edge more pronounced.
- (2) An average procedure is necessary. See pages 337-338.