Chapter 6

SCHOTTKY BARRIER HEIGHT MEASUREMENT

The measurement of the SBH of an MS interface sounds like a boring routine that has been conducted millions of times before, without fanfare or much worth talking about. But the truth is that, for decades, transport data from SBH measurements of routinely formed polycrystalline MS interfaces always contained exciting clues about the formation mechanism of the SBH. These clues, which were hidden in plain sight in old data, were unrecognized by researchers for a long time, until a theory describing the potential distribution and current transport at inhomogeneous MS interfaces was developed.[1] That analytic theory showed what experimental data from polycrystalline MS interfaces long tried to reveal: the SBH was generally inhomogeneous. This was an important step in SBH research, as scientists were forced to confront clear evidence that the SBH depended on the local atomic structure, in direct conflict with what the FLP phenomenon seemed to suggest at the time. Due to the importance of SBH data to be interpreted correctly, this entire chapter is devoted to SBH measurement. We begin with the distribution of potential in the space charge region of an MS interface, followed by carrier transport across the Schottky barrier, and conclude with the many different forms SBH inhomogeneity can manifest itself in experimental data.

6.1 Space Charge Region

The n-type and p-type SBHs are the energy barriers for the transport of electrons and holes, respectively, across the MS interface. Since the CBM at an n-type MS interface is at a significantly higher energy ($\Phi^o_{B,n}$) above the electrochemical potential (FL), dopants near the interface are depleted