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Systematic Variations in Apparent Topographic Height as Measured by Non-contact Atomic Force Microscopy DENG-SUNG LIN, Institute of Physics, National Chiao-Tung University, Taiwan, T.-C. CHIANG, Department of Physics, University of Illinois at Urbana-Champaign, USA, K.M. YANG, J.Y. CHUNG, M.F. HSIEH, S.S. FERNG, Institute of Physics, National Chiao-Tung University, Taiwan — A flat Si(100) surface is prepared with neighboring n- and p- doped regions. The contact potential difference between the tip and the two well-defined regions of similar material is utilized to examine the effects and interplay of essential tip- sample forces in atomic force microscopy. Measurements with a frequency-modulated non-contact atomic force microscope (nc- AFM) show large apparent topographic height variations across the differently doped regions. The height differences depend on the bias polarity, bias voltage, radius, and conducting state of the tip. The functional relationships are well explained by integrated model calculations. These findings provide a coherence scenario of nc-AFM operation under these essential forces and facilitate quantitative understanding of the systematic errors in surface topographic height measurement commonly performed in nanoscience.

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