Understanding the Subtleties of DIC Microscopy

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Our ongoing investigations of DIC microscopy have indicated there is the potential for improving the sensitivity of the system so as to detect very small phase variations in a specimen. In addition, it should be possible to measure these phase variations by using calibration standards and correlating them to actual thickness or refractive index variations within the object. In order for these improvements to DIC to be realized, we must first understand the standard commercial DIC microscope system and its shortcomings, such as its non-linear representation of phase gradients in a specimen as well as the limitation that the phase gradient is imaged along only one direction of shear.

In this presentation, we will discuss several approaches to overcoming the shortcomings of existing DIC microscope systems. These will include (1) an analysis of methods for removing non-linearities using phase-shifting techniques, (2) a comparison of methods for producing images that have phase gradients from multiple directions of shear, (3) a description of calibration procedures for converting image intensity into a measure of optical path length (phase) in a specimen, and (4) a comparison of algorithms used to reconstruct the phase from images acquired from multiple angles of shear.

References

