Abstract Submitted
for the SES08 Meeting of
The American Physical Society

Can we know loading history of solid-state materials? SANICHIRO YOSHIDA, JOHN GAFFNEY, TOMOHIRO SASAKI, CHRISTOPHER SCHNEIDER, Southeastern Louisiana University — Using an optical interferometric technique called electronic speckle-pattern interferometry (ESPI) and a deformation theory called physical mesomechanics (PMM), an attempt is made to identify the loading history of aluminum specimens. The ESPI is used to form interferometric fringes representing in-plane displacement under tensile loading. PMM is used to interpret the obtained fringe patterns. Specimens preloaded to different degrees, ranging from a moderate elastic stage to late plastic stage, are reloaded within the elastic limit for multiple times. Fringe patterns resulting from each reloading cycle are classified in terms of the basic patterns, each representing longitudinal deformation, shear deformation, rotation, and their combinations. Specimens under the same preload/reload condition show a common feature in the transition of the classified patterns, whereas specimens under different preload/reload conditions show different transitions. Generally speaking, fringe patterns tend to show more rotational nature as deformation develops even in the reloading within the elastic limit. This result is consistent with PMM, which characterizes plastic deformation as shear instability leading to rotation.

Sanichiro Yoshida
Southeastern Louisiana University

Date submitted: 15 Aug 2008 Electronic form version 1.4