



IR investigation of density changes of silica glass and soda-lime silicate glass caused by microhardness indentation

A. Koike, M. Tomozawa *

Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, Troy, NY 12180-3590, USA

Received 24 July 2006; received in revised form 13 April 2007

Abstract

Density changes of silica glass and soda-lime silicate glass caused by ball indentation and Vickers indentation were investigated. The IR reflection peak shift of the silica structural band was monitored to determine the extent of the fictive temperature change and the corresponding density change. Under the central portion of the ball indentation, the density of silica glass increased while a change in the soda-lime silicate glass structure was not clear. On the other hand, in the vicinity of the Vickers indentation, the opposite trend was observed. Namely, soda-lime silicate glass exhibited the structural change corresponding to the density decrease, while the structural change of the silica glass was uncertain. The initial density of the silica glass influenced the change of density under ball indentation in such a way that the initial density difference of the glass samples was reduced.

© 2007 Elsevier B.V. All rights reserved.

PACS: 61.43.Fs; 62.20.–x; 62.20.Fe; 78.30.–j

Keywords: Glasses; Mechanical properties; Indentation; Microindentation; Silica; Soda-lime–silica
