

ABSTRACT:

In this paper, methods to measure viscoelastic properties of time-dependent materials are proposed using sharp, flat, and buckling tips inside an environmental SEM. Single W303 yeast cells were employed in this study. Each of the tips was used to indent single cells in a nanoindentation test. Three loading histories were used: 1) a ramp loading history, in which a sharp indenter was used; 2) a step loading history, in which a flat indenter was implemented; and 3) a fast unloading history, in which a buckling nanoneedle was applied. Analysis of the viscoelastic properties of single cells was performed for each of the loading histories by choosing an appropriate theory between the correspondence principle and the functional equation. Results from each of the tests show good agreement, from which strong conclusion can be drawn.