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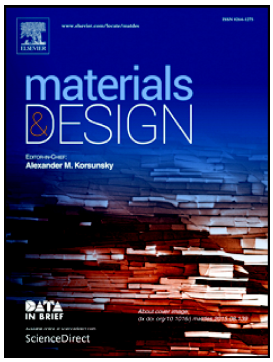

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ACCEPTED MANUSCRIPT

Scratch induced thin film buckling for quantitative adhesion measurements

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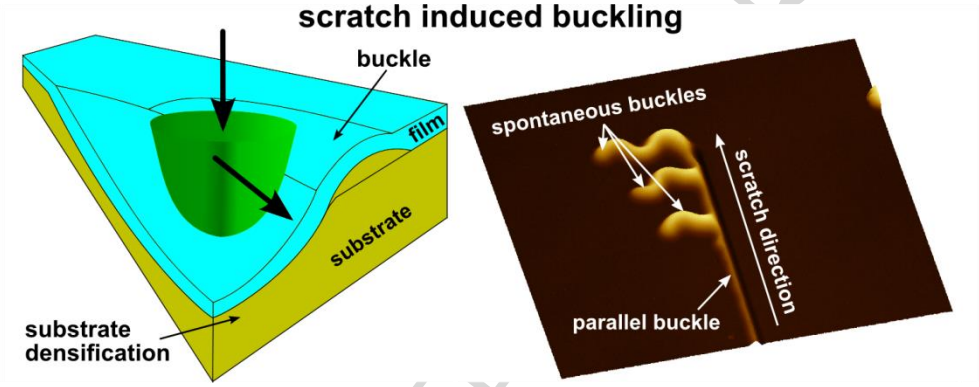

Abstract

Adhesion of thin films is one of the most important factors determining reliability of microelectronic devices and semiconductor industry requires quantitative testing methods to effectively compare these interfaces. Several techniques have been developed over the last decades with scratch induced delamination being a rarely studied method. For compressively stressed films on rigid substrates scratching can cause buckling failure and by modeling the delaminations according to the Hutchinson and Suo model the adhesion can be determined quantitatively. Two different sample systems, a tungsten-titanium film on a silicate glass and a silicon nitride film on a silicate glass with a tungsten-titanium overlayer, have been tested using scratch loads in the range of 100-500 mN. This study demonstrates that the scratching resulted in buckles parallel to the scratch trace and triggered further spontaneous buckling. Using the

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