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Study on Young's modulus of thin films on Kapton by microtensile testing combined with dual DIC system

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Abstract In this paper, a method is proposed to determine the in-plane elastic modulus of thin films. Thanks to our custom-designed dual digital image correlation (DIC) system, it is possible to measure the time-resolved strain of film and substrate simultaneously during the microtensile testing. The macroscopic strain difference between coated and uncoated section allows extracting the elastic constants of thin films with high precision. In the case of 400 nm tungsten films coated on each side of one substrate over half of the gauge length, the value obtained agrees well with the bulk one. Furthermore, finite element method (FEM) has been performed to simulate the mechanical behavior of the specimen. High consistency with theoretical and experimental results is verified.

Keywords: Nanostructured thin films; Microtensile testing; Dual DIC system; Elastic modulus

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