

Buckling-based Metrology and Stretchable Electronics

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The fabrication and applications of 'wavy, stretchable' single-crystal Si on elastomeric substrate will be presented. New mechanical buckling model will also be presented, which was enabled, in part, from the buckling study of high quality, single crystalline material. To check the mechanical buckling phenomenon down to nano/molecular scale, well-aligned single-wall carbon nanotubes (SWNTs) arrays were transferred from growth substrate to elastomer and then made in buckled shape. From this nanoscale buckling of SWNTs, it will be shown that the mechanical moduli of nanoscale materials can easily be determined, even using a model based on continuum mechanics. Finally, the buckling method is now being applied to measure the modulus of polymeric semiconductor materials. Specifically, mechanical moduli of P3HT film and P3HT/PCBM composite film, which are widely used for organic transistors and organic photovoltaics, are measured using buckling phenomenon and will be presented.