Transfer printing processing technologies for fabricating flexible thin film electronicson arbitrary substrate

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Emerging transferprinting processes provide means to realize a range of mechanically flexibleand stretchable electronics, opening up a new prospect in many emergingapplications. In this talk, I will introduce a wafer-scale interfacialdebonding process that can controllably liberate thin film integrated circuitsfrom their native fabrication substrate in a defect-free manner. The resulting 'wafer-free'thin film system can be then thinly mounted on any place of interest, allowing thesurface to become functional with desired electronic properties in a ubiquitousmanner. This methodology is versatile to incorporate dissimilar kinds ofsingle-crystal semiconductor nanomaterials into the system in eitherhomogeneous or heterogeneous layouts, thereby providing high electronic performanceand sensor efficiency. Uniquely, this approach is capable of providing desiredadd-on electronic features on nearly any kind of existing surfaces or objectsto meet the user-specific needs, which would be particularly useful in recentlyemerging electronics applications such as Internet of Things (IoT). Detailedexperimental and computational studies reveal the underlying mechanism of thedefect-free interfacial debonding process and provide a quantitative guidanceto improve the manufacturability in terms of scalability, controllability, andreproducibility. System-level demonstrations illustrate the utility of this approachin the construction of thin film nanoelectronics on a wide range of arbitrary substratesor surfaces including wood blocks, building windows, and paper stickers toendow them with smart functions.