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Transfer Printing Controlled by Substrate Thickness MICHAEL BARTLETT, ALFRED CROSBY, Polymer Science and Engineering Department, University of Massachusetts Amherst — Transfer printing techniques have played an important role in electronics, biology and other fabrication processes. These techniques have been demonstrated to control interfacial adhesion through prescribed actuation mechanisms, surface patterns, or by changing the interfacial adhesion energy through chemical treatments or kinetic control. Here we present a simple transfer printing mechanism which is governed by the geometric confinement of soft, polymeric substrates. As the substrate thickness decreases the adhesive force capacity increases, allowing objects to be printed to thinner substrates without any specific actuation, chemical treatment, or surface topography. This functionality is experimentally demonstrated by printing millimeter and centimeter-scale silicon wafers to progressively thinner substrates. We further show the selective transfer of objects based on position and how these techniques can be used in roll-to-roll processes. We support these experiments with a theoretical model which demonstrates how interfacial confinement enables the precise control of adhesive force capacity, as well as a mechanism to increase interfacial strength.

Michael Bartlett
Polymer Science and Engineering Department,
University of Massachusetts Amherst

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