

Stretchable and flexible silicon-based solar cell arrays

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The high natural abundance of silicon, together with its excellent reliability and good efficiency in solar cells, suggest its continued use in production of solar energy, on massive scales, for the foreseeable future. Although organics, nanocrystals, nanowires and other new materials hold significant promise, many opportunities continue to exist for research into unconventional means of exploiting silicon in advanced photovoltaic systems. Here, we describe modules that use large-scale arrays of silicon solar microcells created from bulk wafers and integrated in diverse spatial layouts on foreign substrates by transfer printing.

The resulting devices can offer useful features, including high degrees of mechanical flexibility, user-definable transparency and ultrathin-form-factor microconcentrator designs. Detailed studies of the processes for creating and manipulating such microcells, together with theoretical and experimental investigations of the electrical, mechanical and optical characteristics of several types of module that incorporate them, illuminate the key aspects.