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## High Efficiency Photovoltaics, Progress towards the Ultimate Limit for Solar Power Conversion

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**Abstract** The efficiency limit for solar power conversion is surprisingly high, sitting at 93%. However, commercially manufacturable silicon photovoltaic solar modules are 20% efficient and limited to 29%. There are several routes for increasing the efficiency of silicon photovoltaic devices with the tandem solar cell as a popular front-runner. Silicon tandem solar cells have achieved efficiencies of almost 37% in the research laboratory with the outstanding challenge of achieving a manufacturable, stable, low-cost, large area module. Alternative approaches to the problem are also possible, for example molecular singlet fission whereby high-energy photons can produce more than one charge carrier in a solar cell device resulting in EQE>100%. While singlet fission could provide a route to manufacturable, low-cost, >30% silicon based PV, this approach has not yet resulted in a solar cell that is more efficient than a bare silicon device.

**Keyword(s)**

III-V, Silicon, Tandem solar cell, Computer modelling, High efficiency

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