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Device architectures for efficient photovoltaics from hard-to-dope semiconductors STEVEN BYRNES, WILLIAM REGAN, WILL GANNETT, ALEX ZETTL, FENG WANG, Department of Physics, University of California at Berkeley, Berkeley, CA, and Materials Sciences Division, Lawrence Berkeley National Laboratory — In the search for cheap and efficient next-generation solar cells, much attention and effort has focused on semiconductor absorber materials which are difficult to dope both p and n, because of self-compensation, trap creation, or other effects. Such materials include oxides, sulfides, nanoparticles, organics, and so on. Even when the material itself has desirable electrical and optical properties for photovoltaic performance, the lack of a p-n homojunction architecture hampers device efficiency. Heterojunctions are a frequent solution, but compatible semiconductors are often unavailable or suboptimal. Therefore, we have explored new, cost-effective device architectures that promise performance comparable to a p-n homojunction, but which require neither bipolar doping nor compatible materials for heterojunctions. These architectures have the potential to bring emerging hard-to-dope semiconductors into technological and commercial relevance.

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