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(54) **Title**: FORMATION OF DEVICES BY EPITAXIAL LAYER OVERGROWTH

(57) **Abstract**: Methods and structures are provided for formation of devices, e.g., solar cells, on substrates including, e.g., lattice-mismatched materials, by the use of aspect ratio trapping (ART) and epitaxial layer overgrowth (ELO). In general, in a first aspect, embodiments of the invention may include a method of forming a structure. The method includes forming a first opening in a masking layer disposed over a substrate that includes a first semiconductor material. A first layer, which includes a second semiconductor material lattice-mismatched to the first semiconductor material, is formed within the first opening. The first layer has a thickness sufficient to extend above a top surface of the masking layer. A second layer, which includes the second semiconductor material, is formed on the first layer and over at least a portion of the masking layer. A vertical growth rate of the first layer is greater than a lateral growth rate of the first layer and a lateral growth rate of the second layer is greater than a vertical growth rate of the second layer.