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Free-standing epitaxial silicon thin films for solar cells grown on double porous layers of silicon and electrochemically oxidized porous silicon dioxide

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Abstract. A process for fabricating free-standing epitaxial silicon thin films for low-cost, high efficiency silicon solar cells is proposed. The films are first grown (via chemical vapor deposition) on double porous layers consisting of a silicon layer (low porosity) and an electrochemically oxidized silicon dioxide layer (high porosity) and then detached by etching the silicon dioxide layer. This double porous layer structure was fabricated by the electrochemical fabrication of a double-layer porous silicon in *HF* solution followed by additional electrochemical oxidation in *HCl* solution. Because this additional oxidation mainly occurred on the high-porosity silicon dioxide bottom layer that was used as a sacrificial layer in the detachment of the grown epitaxial thin film. Annealing the structures in hydrogen prior to the epitaxial growth removed the surface oxide on the top low-porosity silicon layer. The double porous layers of silicon and silicon oxide could be appropriate seed layers for epitaxial silicon growth. EDS and SEM analysis of the grown silicon film on the

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