Abstract

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Chemical-Vapor Deposited Large-Area Multicrystalline Epitaxial Silicon Solar Cells on Upgraded Metallurgical Silicon/Graphite Substrates

Very large-area (200 cm2) thin multicrystalline silicon sheets having large grain size were produced directly on graphite by unidirectional solidi?cation of acid-leached and gettered metallurgical silicon powder. The metallurgical silicon powder was acid treated by re?uxing in aqua regia for several days and then gettered in air with P2O5 at 1050°C for 3–5 days. After cleaning and drying the acid-treated and gettered silicon, it was uniformly spread on top of a graphite boat, Radio-frequency (RF) heated to melt and then unidirectionally solidi?ed to form a polycrystalline substrate. This resulted in an n + substrate having a resistivity of about 0.03 V cm. P–N junction solar cells were formed by the epitaxial deposition of n- and players using the hydrogen reduction of trichlorosilane. Front grid contact was formed by vacuum evaporation of Ti and Ag. Solar cell characterization results are very promising. This substrate preparation technique is cost-effective, produces low-cost ?at rectangular and mechanically strong multicrystalline silicon substrates, suitable for the continuous large-volume production of solar cells.