THE FINAL WORD

The official e-newsletter of Industrial chemistry(IC) department, V.V.Nagar, Anand, Gujarat

SILICON DEPOSITION FOR SOLAR CELL APPLICATION

Silicon (Si) is one of the most important semiconductors widely used in varieties of applications such as fabricating various electronic devices, solar PV cells and negative electrode material for Li-ion battery**.** It is the most available element on earth in terms of mass after oxygen. Since last few decades, many semiconducting materials such as Silicon, Cadmium Telluride, Copper Indium Diselenide and Gallium Arsenide have been investigated, but Silicon remains as the most widely used material for photovoltaic and other optoelectronic applications due to the advantages such as availability its source material, suitability of physical and chemical properties of Si, established low-risk technologies around Si, and low health and environmental risk for its use or end-of-life disposal/recycling. At room temperature, it has in-direct band gap of 1.12 eV. It has the higher optical efficiency than any other commercially used semiconductors such as GaAs and CdTe. However, the quantum efficiency of silicon is comparatively low.

There are three types (grades) of Silicon, currently available in the market.

❶ Metallurgical grade Silicon (MG–Si) with a purity of 98-99%,

❷ Semiconductor grade Silicon (SeG–Si) with the impurity in the range of ppb– ppt,

❸ Solar grade Silicon, SoG–Si with the impurity content in the range of ppm.

Currently Solar- and Semiconductor grade silicon are fabricated using very expensive and energy intensive technologies such as Plasma Enhanced Chemical Vapor Deposition (PECVD), Sputtering, Photolithography, laser ablation etc. Current solar grade silicon wafers are produced from Mg-Si by multiple refining process using commercial techniques such as **Siemens technique** and **Czochralski technique**. These techniques are highly energy intensive and costly. The Siemens technique requires 100-200 kWh/kg of electricity. It also produces 90 tons of CO_2 per 1 ton of SoG-Si. Currently, silicon is deposited by methods such as Chemical Vapor Deposition (CVD), RF spattering, DC sputtering, Thermal evaporation and Plasma Enhanced Chemical Vapor Deposition (PECVD). The major disadvantages of above mentioned deposition techniques are the involved cost, the involved complexity, raw material consumption and slow rate of deposition at large scale.

Many alternative routes have been explored since last few decades to reduce its fabricating cost and required energy demand. One of the most promising routes is electrochemical deposition. Electro-deposition is an elegant technique compare to all other above mentioned methods because of its simplicity, versatility, easy scalability and very low cost. The target structure and size can be easily influenced by known parameters such as voltage, current density and concentration of solute. The consumption of source material is less in case of electro deposition compare to other techniques. Silicon is highly reactive with moisture and oxygen and forms silica by getting oxidized which is insulator. Due to its tendency to get oxidized by reacting with moisture and oxygen, rigorous atmospheric control with very low oxygen and moisture content of about 2 to 3 ppm is required in every silicon fabrication processes. Since 80's many studies have been carried out to deposit silicon electrochemically. It is easily scalable and in principle it allows to deposit any semiconductor on any conducting substrate.

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RESULT OF 'MY IC' (2018)

Sr No.	Class/ Semester	No. of Admission Granted	Total Appeared in Exam	Total Cleared	Not Cleared	Sp University Result(%)	College Result (%)	More than 7-GP	GP 7.00 to 5.99	GP 5.00 to 5.98
1.	M.Sc. 2nd Sem.	70	68	68	00	100.00	100.00	50	17	01
2.	M.Sc. 4th Sem.	70	70	68	02	95.77	97.14	25	28	15

Designed By:-
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