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Silicon Rising Again - Use silicon Nano-structures for Energy related Devices

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Silicon is widely used in electronic industries in a number of forms, for example: amorphous silicon is used in liquid-crystal display units; poly-silicon is used in Flash memory structures & photovoltaic solar cells and single crystals are used in C-MOS technologies. Among various forms of silicon embodiments, silicon nano-structures (for example silicon nanowires). However, before silicon nano-structures become integrated into a commercial product (for example, in consumer plastic electronics or batteries or solar cells), there are still major challenges to conquer. These include optimizing growth conditions, ***low-temperature growth of silicon nano-structures***. For the growth of nano-structures, widely employed chemical vapour deposition (CVD) techniques is in practice. However, the growth temperatures relevant to this technique exceed 600^{o}C, which results in very high thermal budgets and process is not compatible cheap and flexible substrates. Using a combination of pre-growth preparation steps and plasma enhanced chemical vapour deposition (PECVD), have been shown to result in the growth of silicon structures (micro and nano sized) ≤ 300°C. Using this process, we are able to grow silicon structures on plastic/glass substrates and have demonstrated their use in photovoltaic solar cells and anode of Li-Ion batteries. In a nutshell, I plan to discuss the progress in this field over the last 10 year, and invoke the conundrums that scholars of this field are currently faced with.

Prof. Shashi Paul is head of **E**ngineering and **P**hysical **s**ciences **i**nstitute- ***E-Psi*** (*εψ*) and Emerging Technologies Research Centre(EMTERC), De Montfort University, Leicester, United Kingdom. He graduated from Indian Institute of Science (IISc), Bangalore, India and previously worked at Cambridge University, Durham University and Rutgers University. He has extensive experience in the field of deposition of nano-sized organic and inorganic materials in the context of their applications to electronic memory devices, thin film transistors and energy related devices.

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