huge commercial success, research and development of MEMS technology actively continues all over the world.

Due to their versatility, MEMS sensors are increasingly being used in many fields of science, including the physical, engineering and medical sciences. In the last decade, a number of research institutions in the fields of geophysics and seismology started taking interest in this promising technology.

Nowadays, the sensitivity and dynamic range of these sensors are such as to allow the recording of earthquakes of moderate magnitude even at a distance of several tens of kilometres[1,2]. Moreover, because of the low cost and small size, MEMS accelerometers can be easily installed in urban areas in order to establish a USN constituted by densely spaced stations. California has already started the development of seismic networks consisting of MEMS sensors such as the Quake-Catcher Network[3], operated by Stanford University, and the Community Seismic Network[4] operated by the California Institute of Technology. An European urban MEMS-based seismic network for post-earthquake rapid disaster assessment has also been established in Eastern Sicily, Italy[5].

It is becoming obvious that MEMS technology will revolutionize, the way earthquakes will be monitored, which will help develop strategies for earthquake risk reduction.

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Further to 'Polysilicon production in India'

I was most interested to read the Historical Note by Gopala Krishna Murthy[1] on Silicon technology in India. This in a way complements my own note[2] on 'Polysilicon production in India' in the same issue. I was however unaware that Metkem continued its activities till 2009. I would like to address a few points raised by Murthy[1] and hence mention some of the work carried out at the Indian Institute of Technology, Kharagpur.

As professor at the Materials Science Centre in IIT Kharagpur from 1977, my first acquisition was a Metals Research Silicon Crystal Growth System capable of also float-zone and Bridgman growth. My group carried out a consultancy project 'Purification and characterization of silicon by float zone technique' for Grindwell & Norton, Bangalore (mentioned in the earlier article[1]) between 1981 and 1982. Later, we also trained some scientists from North Korea, who came under the aegis of ETTDC in Si crystal growth, as this was the only laboratory in the country equipped for the purpose. However, my main interest was the development of low-cost silicon from rice husk[3]. We used alumino-thermic reduction followed by directional solidification to grow a 4 inch diameter multi-crystalline silicon ingot. Since this work has been reported mainly in conference proceedings[4], I hope to write a separate report.

There was no involvement of NML at any stage in our work. We supplied fine silica particles to a tyre company for application as filler in rubber tyres. The industry never got back to us. The highly reactive nature of white ash is suitable for the production of SiC and SiN for which high purity is not a prerequisite. Thus a viable project with low cost by-products was quite feasible. In 1982, the Swiss Government was interested in sizeable funding of our project as it would generate rural employment, but this fell through due to internal politics. The question we always faced from Indian funding agencies was 'Has this been done elsewhere?'

I was an adviser to Super Semiconductors Kolkata (also mentioned in the article[1]) in an informal capacity and visited their plant near Kalyani. The company had a Hamco crystal puller for 6 inch diameter crystals, and very rudimentary cutting and polishing equipment with little technical expertise. Some of the wafers produced were highly compensated and showed no photo-response. The surface finish was also poor as pointed out by CEL. Under Tapan Bhattacharya, CEL developed a complete production line for single-crystal silicon solar cells in the early eighties with completely home-grown technology. Bhattacharya is unfortunately forgotten as the pioneer in Si PV cells and module production in India.

Multicrystalline silicon prepared by directional solidification now supplies the major part of silicon for solar PV cells as it avoids single-crystal growth, produces rectangular ingots and thus avoids cutting losses. Of the companies mentioned[1] as having ventured into polysilicon of late, only Birla Surya (sic!) near Pune made substantial investments in plant and equipment. Some others such as Maharishi Solar, Chennai are growing crystals from imported polysilicon and producing their own modules.

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