Porous silicon – metal oxides: multifunctional materials for advanced technologies

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Last years have seen spectacular progress in the design, preparation, and characterization of nanostructured materials. Silicon nanostructures (e.g. porous silicon – PSi) have attracted extensive attention due to the unique structural and optoelectronic properties. Because of its unique physical properties, PSi has a large number of applications in optoelectronics, biotechnology, renewable energy etc. Besides, any device application of PSi is bound to be successful because of the low cost of silicon and compatibility with the modern integrated circuit industry. However, optical, structural and sensing properties of the PSi are not very stable. Therefore, the issue of the PSi stability is significant and requires further investigations.

Recent interest has been paid by researchers to the nano-scale metal oxides, which has highly active surface area and demonstrates new properties, induced by quantum-size effects. It is expected that metal oxide coatings of such nanostructures as PSi will form nanostructures possessing novel optical, structural and electrical properties that can be used for development of new devices. Recent publications about the Li-ion battery anode material, biosensors, photovoltaics and photoelectrochemical materials confirm this expectation. Thus, PS-metal oxide structures are very promising for fabrication and improvement of various optical and electronic devices.

We report the physical properties of ALD metal oxide coated PSi surface. This discovery also provides a new understanding of morphology and phase evolution during ALD of porous materials. The results obtained are very promising for the improved use of PSi-metal oxide structures in photocatalysts, photovoltaic and sensor application where it is important to tune their physical properties by the morphology of PSi- metal oxide [1, 2].

References

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