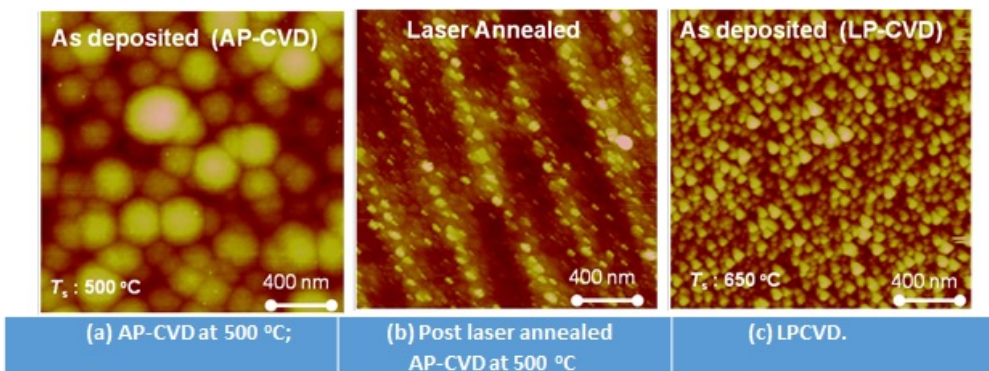


Silicon Thin films with Embedded Heteroatoms (RFT-449)

Invention Summary

Scientists at NDSU have discovered methods for forming silicon thin films and structures with incorporated metals, non-metals, and combinations thereof. The precursor compositions useful in such methods are generally liquid at ambient temperature and are comprised of liquid silane(s) and metal and/or non-metal source(s). The compositions may be processed by printing, coating, or spraying onto a substrate and subjected to UV, thermal, IR, and/or laser treatment to form silicon films or structures with embedded heteroatom(s). These compositions allow for the control of dopant level prior to film processing allowing for very high doping levels with minimal out-diffusion. The available dopants are not highly toxic (as is the case for phosphine and diborane) and provide a means for film deposition without the use of expensive vacuum chambers.



Benefits

The doping, implantation, and alloying of silicon requires the use of hazardous materials and methods that depend on toxic gasses and are limited in scope by process capabilities. The limitations and cost of current technologies can be skirted if a transition to continuous solution processing methods can be achieved. This invention enables the dispersion of hetero atoms and structures within the silicon matrix before transformation to a solid allowing implantation of atoms, polynuclear semiconductors, clusters, quantum dots, nanoparticles, and nanomaterials which are technically challenging or not realized using current forms of thin film deposition. The invented process provides capabilities to make hybrid materials that are unique to the field of silicon.

Applications

These inventions have applicability in the photovoltaics, microelectronics, Li-ion battery (anode), photovoltaic, display, optoelectronic devices and biomedical market.

Patents

This portfolio contains three separately-disclosed technologies that are all patent pending with worldwide patent rights.

Status

Optioned Exclusively in all Fields of Use and in all Territories.

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