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Practical Routes to (SiH3)3P: Applications in Group IV Semiconductor Activation and in Group III-V Molecular Synthesis

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Inventors

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Background

Semiconductors have revolutionized the world of electronics and are found in practically every electronic device currently used. One of the aspects of semiconductor materials that make them so useful is that the behavior of a semiconductor can be easily manipulated through doping. However, with current methods of developing the dopant $(SiH_3)_3P$ hydride, toxic and unstable starting materials are needed and effective *n*-doping has been traditionally very difficult to achieve by conventional physical and chemical methods including implantation of solid sources and vapor deposition.

Invention Description

Researchers at Arizona State University have developed a new single step method to develop the $(SiH_3)_3P$ hydride used as a practical source for n-doping of group IV (Si-Ge-Sn) semiconductors. The compound is produced in high purity quantitative yields via a single-step method based on reactions of SiH_3Br and $(Me_3Sn)_3P$ that circumvents the need for toxic and unstable starting materials. In addition the method provides up to 70% yields and offers potential for industrial scale-up methodology.

Potential Applications

- Silicon based lasers
- Silicon Photonics
- Optical Devices
- Photovoltaics
- Silicon Electronics

Benefits and Advantages

- Starting materials are less toxic and more stable than alternative approaches
- Allows for industrial scaling
- The Si co-dopant plays an essentially passive role and does not compromise the device quality of the host material nor does it fundamentally alter its optical properties

Intellectual Property Status:
Patent Pending

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