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(71) Applicant *(for all designated States except US)*: **ARIZONA BOARD OF REGENTS, acting for and on behalf of ARIZONA STATE UNIVERSITY** [US/US]; Brickyard, Suite 601, Room 691AA, 699 S. Mill Ave., Tempe, AZ 85281 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **KOUVETAKIS, John** [US/US]; 7032 E. Indigo, Mesa, AZ 85207 (US). **TSONG, Ignatius, S., T.** [US/US]; 1445 E. Palomino Drive, Tempe, AZ 85284 (US). **HU, Changwu** [CN/US]; 1688 W. Encinas Street, Gilbert, AZ 85233 (US). **TOLLE, John** [US/US]; 1489 S. Dove Street, Gilbert, AZ 85233 (US).

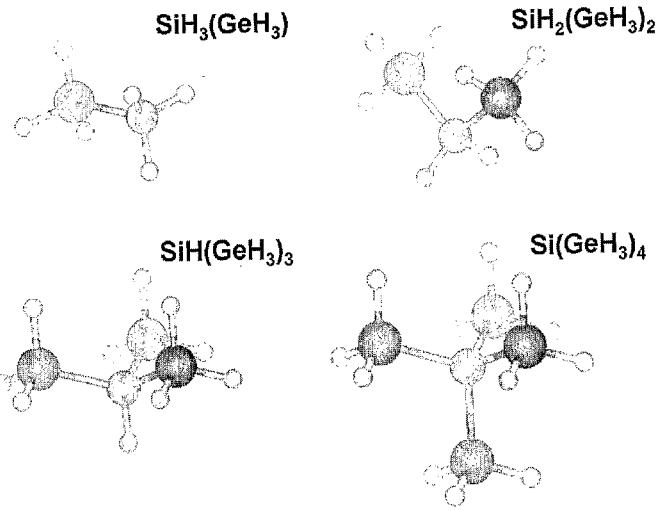
(74) Agent: **ONEY, Richard, E.**; Tiffany & Bosco, P.A., 2525 E. Camelback Road, Third Floor, Phoenix, AZ 85016 (US).

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(54) Title: METHOD FOR GROWING Si-Ge SEMICONDUCTOR MATERIALS AND DEVICES ON SUBSTRATES



(57) Abstract: A method is provided for growing Si-Ge materials on Si(100) with Ge-rich contents (Ge>50 at.%) and precise stoichiometries SiGe, $SiGe_2$, $SiGe_3$ and $SiGe_4$. New hydrides with direct Si-Ge bonds derived from the family of compounds $(H_3Ge)_XSiH_{4-X}$ (x=1-4) are used to grow uniform, relayed and highly planar films with low defect densities at unprecedented low temperatures between about 300-450 °C, circumventing entirely the need of thick compositionally graded buffer layer and lift off technologies. At about 500-700 °C, $SiGe_X$ quantum dots are grown with narrow size distribution, defect-free microstructures and highly homogeneous elemental content at the atomic level. The method provides precise control of morphology, composition, structure and strain via the incorporation of the entire Si/Ge framework of the gaseous precursor into the film. The grown materials possess the required morphological and microstructural characteristics for applications in high frequency electronic and optical systems, as well as templates and buffer layers for development of commercial devices based on high mobility Si and Ge channels.

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