

Doping of germanium surfaces

VALUE PROPOSITION

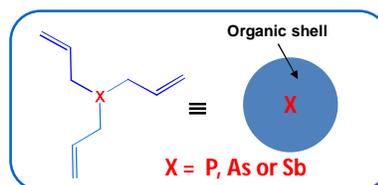
Molecular Monolayer Doping (MLD) has a number of important advantages in comparison to conventional doping methods like ion implantation, particularly for non-planar geometries such as nanowires and fin-FETs. This technology is the first known method for MLD on germanium.

THE TECHNOLOGY

The fundamental component of CMOS device technology is a doped or extrinsic semiconductor. Doping is a process whereby impurities are introduced into the crystal lattice of the semiconductor, creating charge carriers that change the electrical conductivity, imperative for electronic (e.g. transistors) applications. Doping is currently carried out by ion implantation. However, the reality for transistor doping, as planar CMOS devices approach 10 nm characteristics, is that implantation techniques will not suffice.

Molecular Monolayer Doping (MLD) is a potential solution to the problem. MLD is a method based on the premise that surface functionalisation and precise atomistic control of the dopant position and composition can be achieved within the semiconductor. However MLD has not been achieved on germanium until now. Thermal decomposition of this molecular layer will enable freed-up dopant atoms to diffuse into the underlying semiconductor. As well as achieving high level control over the positioning of the dopant atoms, minimal damage to the crystal structure of the underlying substrate will occur due to the gentle nature of the process.

PROCESS STEPS IN MLD PROCEDURE



1. Clean germanium surface

Ge

2. React doping molecule with substrate



Ge

3. Deposit capping layer



Ge

4. Heat sample using rapid thermal anneal



5. Remove capping layer.



STATUS/ DEVELOPMENT OBJECTIVES

Proof of concept process developed
US patent pending
Seeking licensees or collaborators

FIELD OF APPLICATION

Semi-conductors

FUNDING



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