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Spin-On Organic Polymer Dopants for Silicon BHOOSHAN POPERE, MEGAN HOARFROST, Univ of California - Berkeley, ANDREW HEITSCH, PETER TREFONAS, Dow, RACHEL SEGALMAN, Univ of California - Berkeley — Conventional doping of crystalline Si via ion implantation results in a stochastic distribution of doped regions in the x-y plane along with relatively poor control over the penetration depth of dopant atoms. As the gate dimensions shrink to 10 nm, the related device parameters also need to be scaled down to maintain electrical activity. Thus, highly doped, abrupt, ultra-shallow junctions are imperative for source-drain contacts to realize sub-10 nm transistors. Uniform ultra-shallow junctions can be achieved via monolayer doping, wherein thermal diffusion of a self-limiting monolayer of dopant atom-containing organic on Si surface yields sub-5 nm junctions. We have extended the use of organic dopant molecules in the monolayer doping technique to introduce a new class of spin-on polymer dopants. In effect, these new spin-on dopants offer a hybrid between the monolayer doping technique and traditional inorganic spin-on dopants. We have been able to uniformly introduce p- and n-type dopants with doping efficiencies comparable to the monolayer doping technique. Control over junction depth can be easily achieved via optimizing annealing temperature and time.

Bhooshan Popere
Univ of California - Berkeley

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