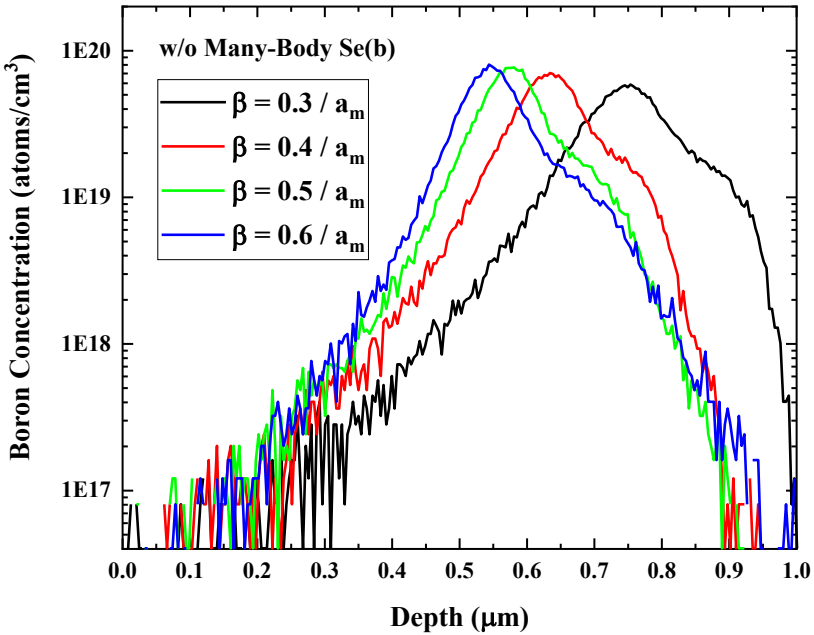
Effects of the newly developed electronic stopping power (Se(b)) option “Oen with many-body”

In scatGUI, Se(b) (impact parameter dependent stopping power) is normalized to the electronic stopping power of Ziegler’s stopping power. Until v1.39, only the Se(b) from nearest-neighbor atoms was considered. When the **interatomic distances are short, as in diamond**, the Se(b) from the **second nearest and other atoms must be added** to calculate the correct implantation distribution.

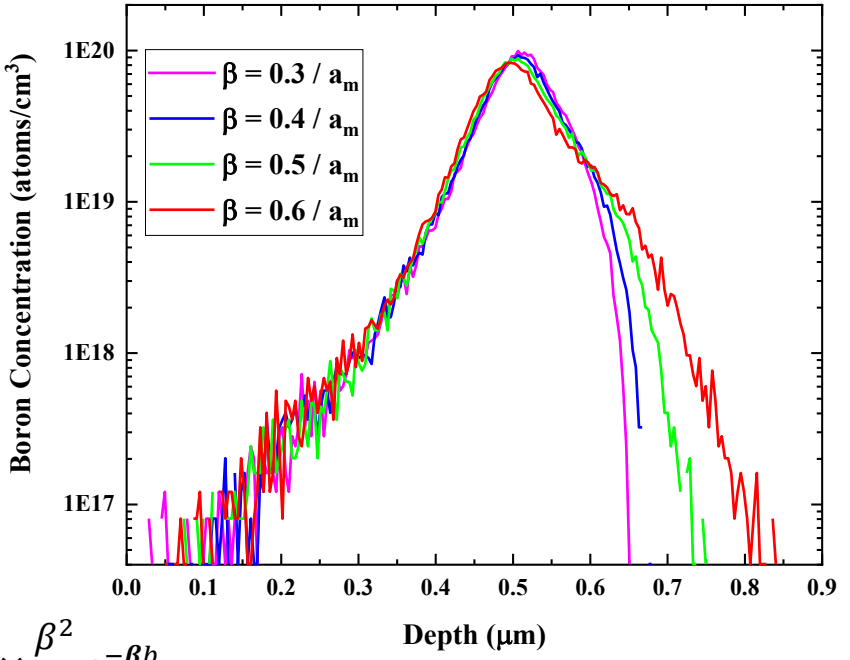
Random implantation

Calculations considering only nearest-neighbor atoms



greatly improved

Calculation considering 2nd neareset-neighbor, etc. (Se(b) : Oen with Many-Body)



$$S_e(E,b) = S_{e,Ziegler}(E) \times \frac{\beta^2}{2\pi} e^{-\beta b}$$

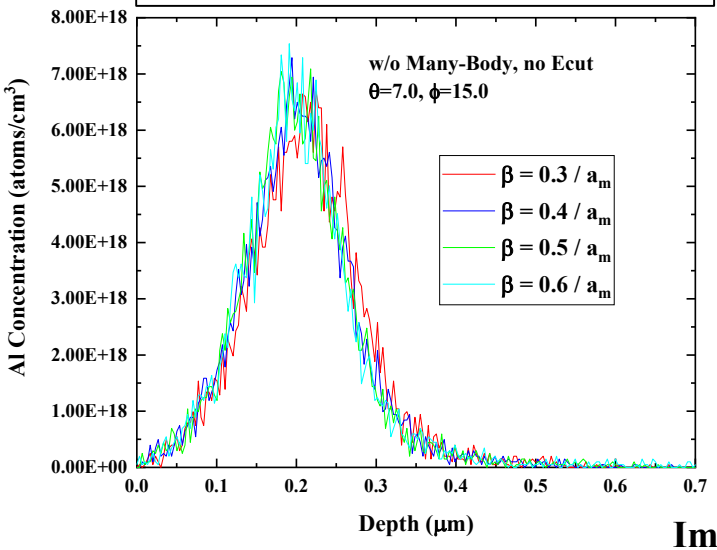
In scatGUI, the random stopping power is normalized to be the Ziegler’s stopping power through $S_e(E,b)$, so the average implantation range should be the same for random implantation even if the β values of Oen’s formula are different.

θ=7, φ=60, Se : × 1, displacement energy 55 eV, (sample temp. : 650K, Debye : 1880K)

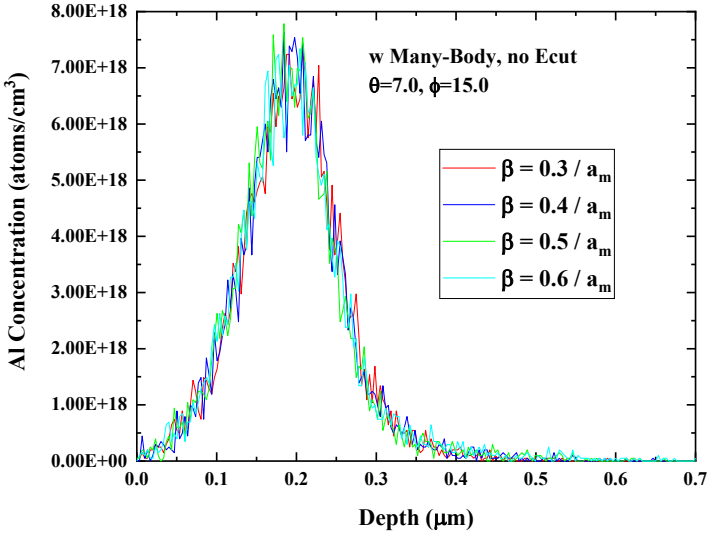
Difference by β value in the case of 180 keV Al → 4H-SiC(0001), <0001>.

Random implantation

Calculations considering only nearest-neighbor atoms



Calculation considering 2nd neareset-neighbor, etc. (Se(b) : Oen with Many-Body)



Improved, but
Difference is small to begin with.

With the interatomic distance of SiC, the change in distribution is small, but for small β values, there is a slight change, so it is better to select “Oen with Many-Body”.