METHOD FOR DETERMINATION OF PROXIMITY FUNCTION PARAMETERS VIA MONTE CARLO CALCULATION AND DEVELOPMENT SIMULATION

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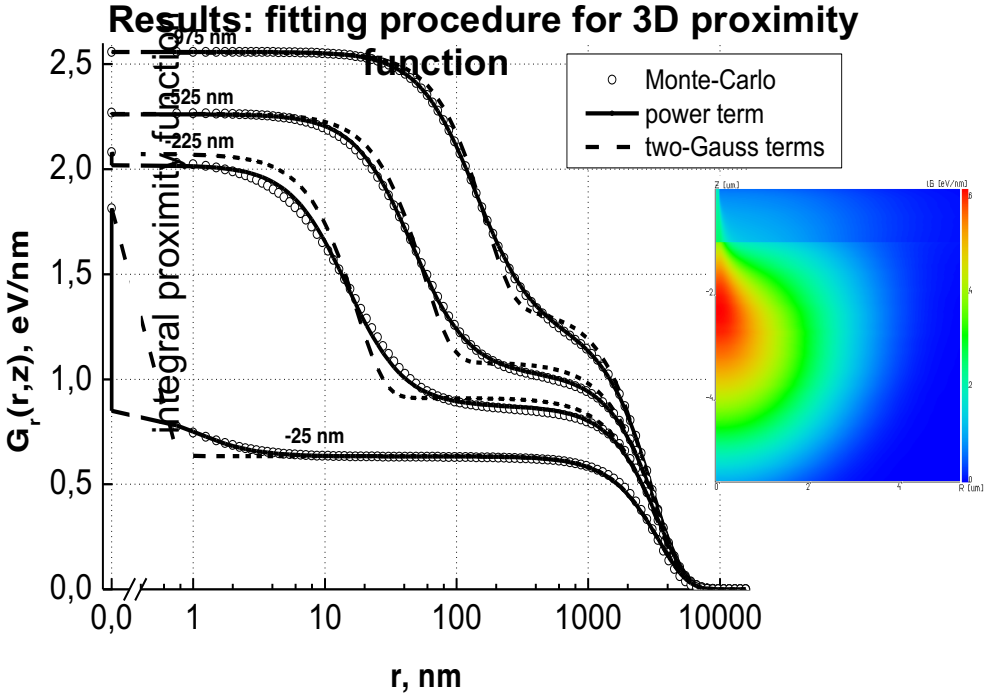
The paper presents a program for modeling electron scattering in layered materials and a methode for determination of EBL proximity parameters. The method is implemented in hard/software system “NanoMaker”. (www.nanomaker.com)

1. Calculations show that the absorbed energy density is three-dimensional. It is pointed out the contribution of the forward-scattered electrons is better described by a power function rather than the commonly used Gaussian.

2. It is shown that for practical correction of the proximity effect, it is possible, nevertheless, to use the classical two-dimensional proximity function (two Gaussians) containing three parameters α, β, η. Good agreement of the obtained parameters and experimental data for various substrates and electron energies is shown.

3. Thus, a method for calculating the parameters of the classical proximity function for arbitrary layered substrates based on Monte Carlo calculation and development consideration has been developed.



Fitting (at four cross sections) shows that power-term probing function definitely describes M-C data better than two-Gauss function PMMA film of 1um thickness,
Substrate Si, E = 25KeV, Trajectories number 200000

Table 4. Comparison experimental proximity parameters β_e, η_e with calculated effective parameters for Ge and diamond shows very good agreement.

PMMA thickness 0.5um,

Substrate	Ge				C (diamond)			
Density	5323 кг/м^3				3500 кг/м^3			
E, keV	β_e	β_s	η_e	η_s	β_e	β_s	η_e	η_s
11	-	0.73	-	1.26	0.7	0.79	-	0.51
15	0.7	0.92	-	1.28	1.0	1.08	-	0.41
20	1.1	1.15	-	1.24	1.6	1.61	-	0.33
25	1.4	1.46	1.1	1.18	2.1	2.23	0.45	0.3
30	1.8	1.84	-	1.12	2.6	2.96	-	0.29
35	2.5	2.27	-	1.08	3.6	3.87	-	0.26
39	-	2.67	-	1.06	-	4.63	-	0.25