

Supplementary Information

A Multi-Objective Optimization of 2D Materials Modified Surface Plasmon Resonance (SPR) Based Sensors' Response: NSGA II Approach

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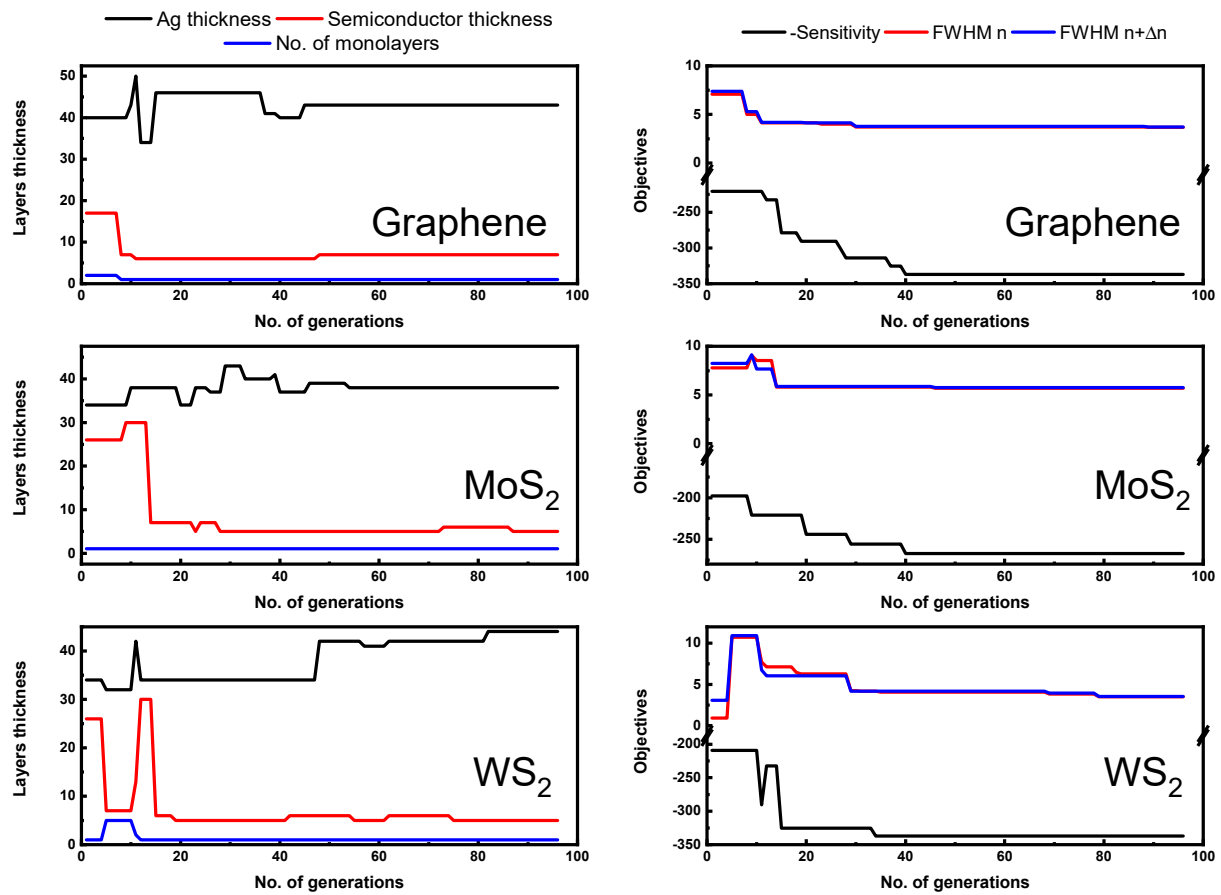


Figure S1: Convergence plots for the Ag-Semiconductor-2D material-Sensing medium ($n_{\text{semiconductor}}$) configuration with -sensitivity and FWHM as objectives; Left column: the layers thicknesses convergence and right column: the objectives

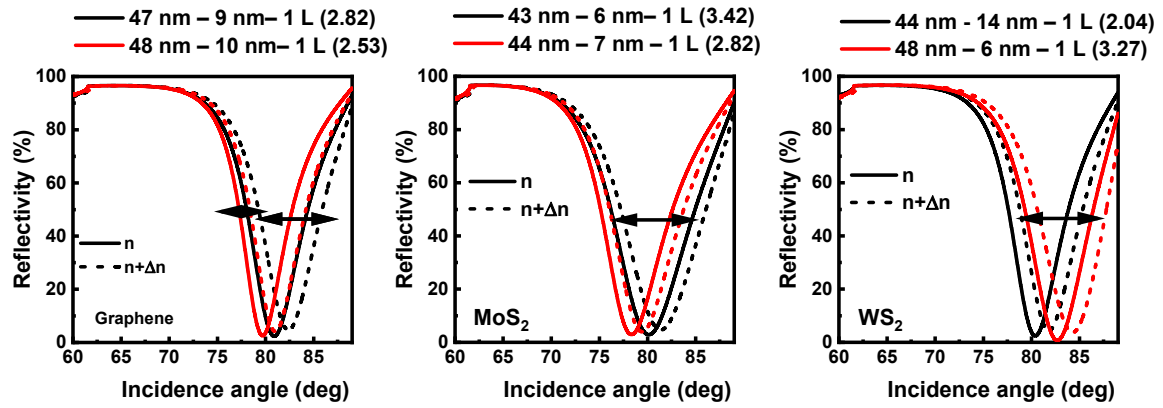


Figure S2: Reflectivity curves for the Ag-Semiconductor-2D material-Sensing medium ($n_{\text{semiconductor}}$) configuration

Table S1: Additional configurations for the structure: Ag-semiconductor-2D material-Sensing medium

L.N.	Material	Configuration: Ag – semiconductor – 2D material -sensing medium – ($n_{\text{semiconductor}}$)	Sensitivity [deg/RIU]	FWHM [deg]
1	Graphene	47 nm – 9 nm– 1 L (2.82)	285	5.6
2		48 nm – 10 nm– 1 L (2.53)	250	4.9
3	MoS ₂	43 nm – 6 nm– 1 L (3.42)	250	7.6
4		44 nm – 7 nm – 1 L (2.82)	228	6.6
5	WS ₂	44 nm - 14 nm – 1 L (2.04)	320	6.4
6		48 nm – 6 nm – 1 L (3.27)	270	5.52

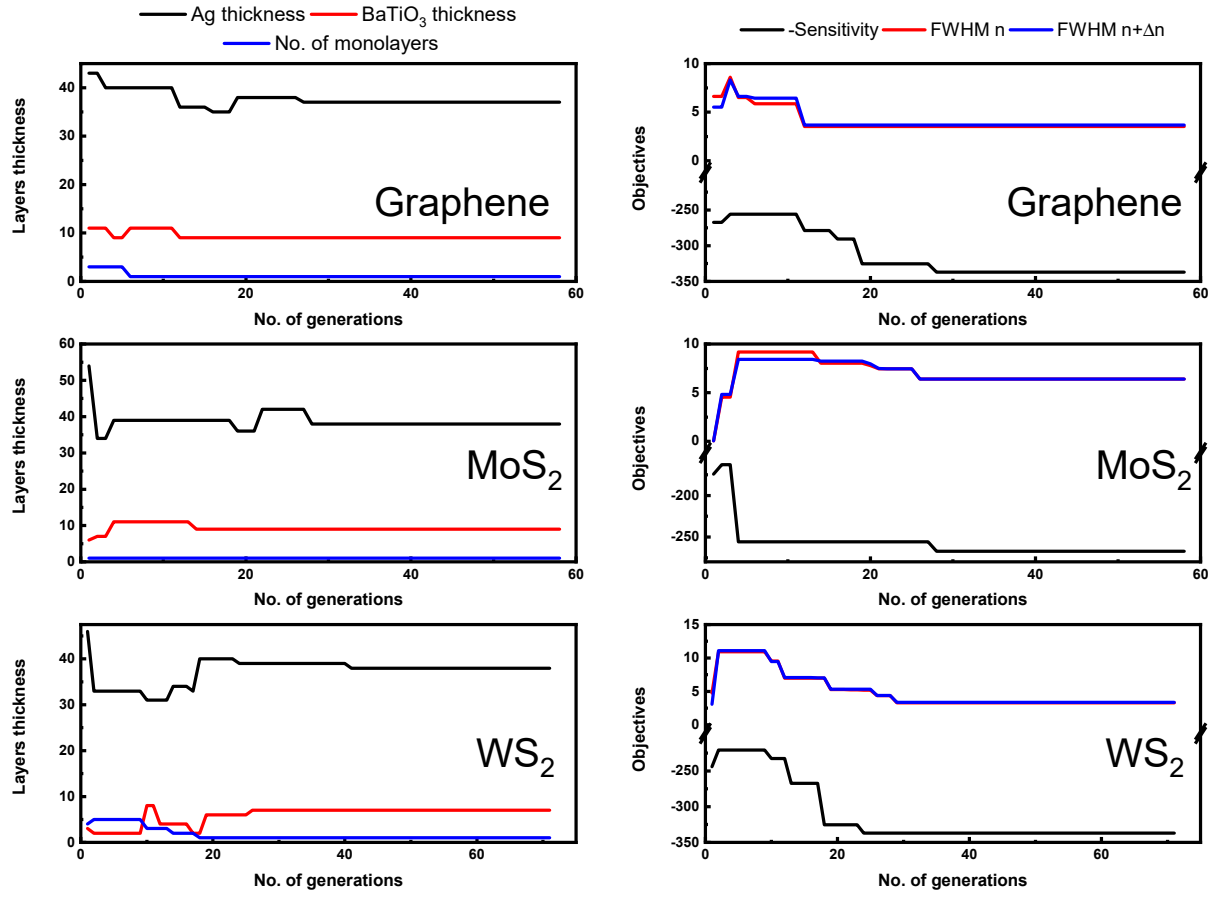


Figure S3: Convergence plots for the Ag-BaTiO₃-2D material-Sensing medium configuration with -sensitivity and FWHM as objectives; Left column: the layers thicknesses convergence and right column: the objectives convergence

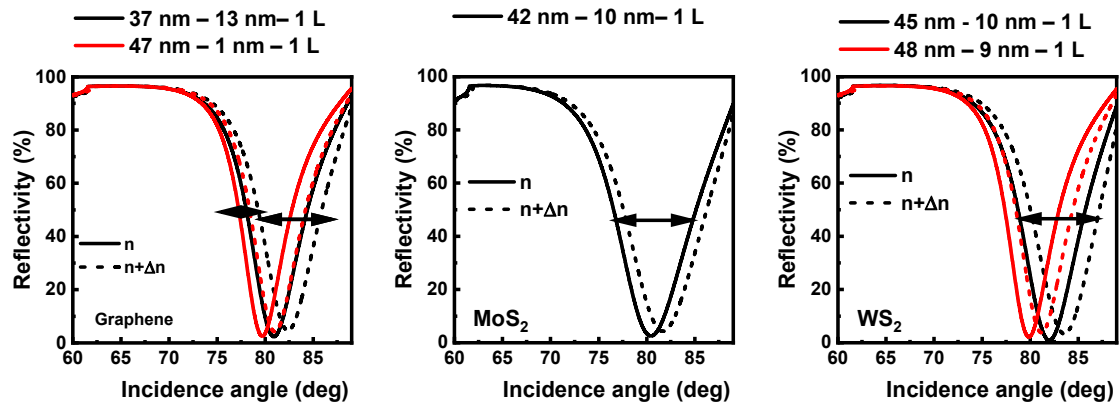


Figure S4: Reflectivity curves for the Ag-BaTiO₃-2D material-Sensing medium configuration

Table S2: Additional configurations for the structure: Ag-BaTiO₃-2D material-Sensing medium

L.N.	Material	Configuration: Ag – BaTiO ₃ – 2D material -sensing medium	Sensitivity [deg/RIU]	FWHM [deg]
1	Graphene	37 nm – 13 nm– 1 L	315	8
2		47 nm – 1 nm– 1 L	257	5.4
3	MoS ₂	42 nm – 10 nm– 1 L	250	7.4
4	WS ₂	45 nm - 10 nm – 1 L	310	6.3
5		48 nm – 9 nm – 1 L	260	5

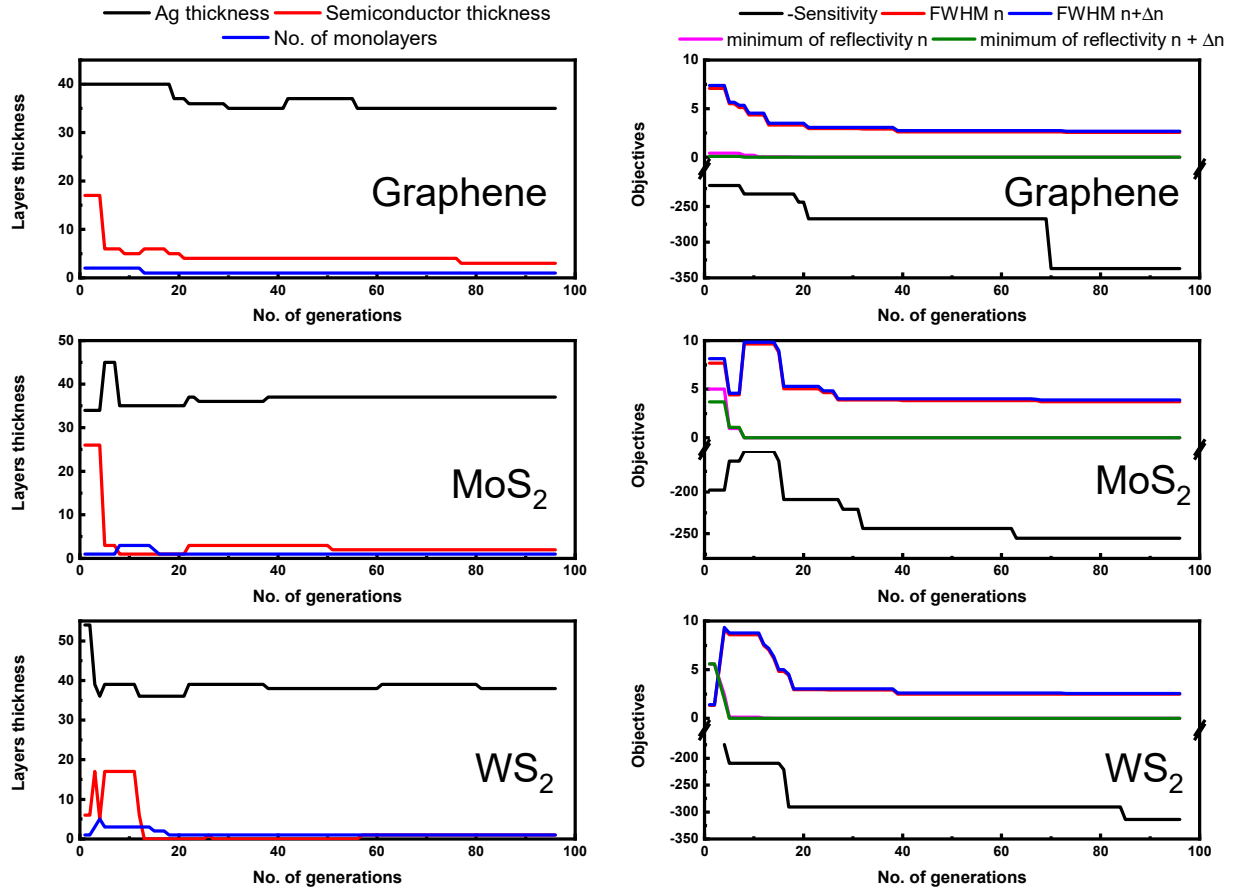


Figure S5: Convergence plots for the Ag-Semiconductor-2D material-Sensing medium ($n_{\text{semiconductor}}$) configuration with -sensitivity, FWHM, and minimum of reflectivity as objectives; Left column: the layers thicknesses convergence and right column: the objectives convergence

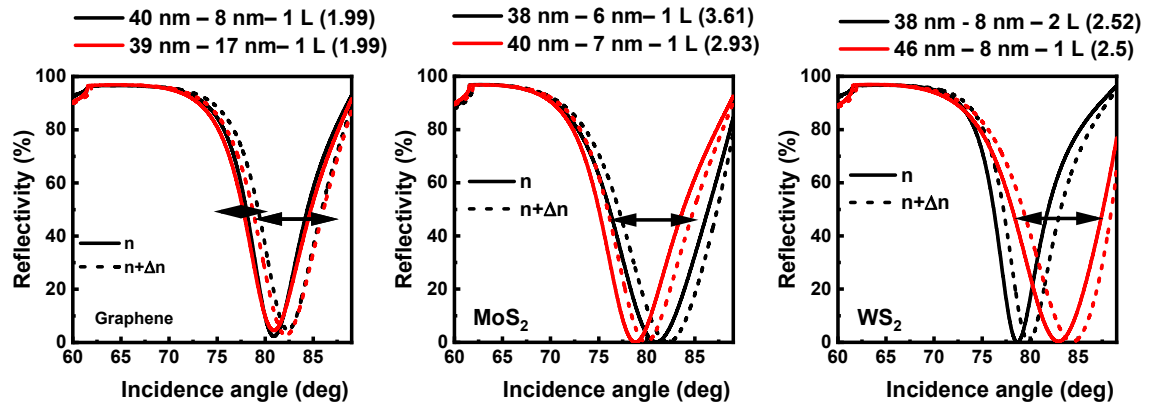


Figure S6: Reflectivity curves for the Ag-Semiconductor-2D material-Sensing medium ($n_{\text{semiconductor}}$) configuration with -sensitivity, FWHM, and minimum of reflectivity as objectives;

Table S3: Additional configurations for the structure: Ag-Semiconductor- 2D material-Sensing medium

L.N.	Material	Configuration: Ag – semiconductor – 2D material -sensing medium – ($n_{\text{semiconductor}}$)	Sensitivity [deg/RIU]	FWHM [deg]
1	Graphene	40 nm – 8 nm– 1 L (1.99)	285	7.5
2		39 nm – 17 nm– 1 L (1.99)	260	8.3
3	MoS ₂	38 nm – 6 nm– 1 L (3.61)	235	10
4		40 nm – 7 nm – 1 L (2.93)	218	8.66
5	WS ₂	38 nm - 8 nm – 2 L (2.52)	280	9
6		46 nm – 8 nm – 1 L (2.5)	235	5.7

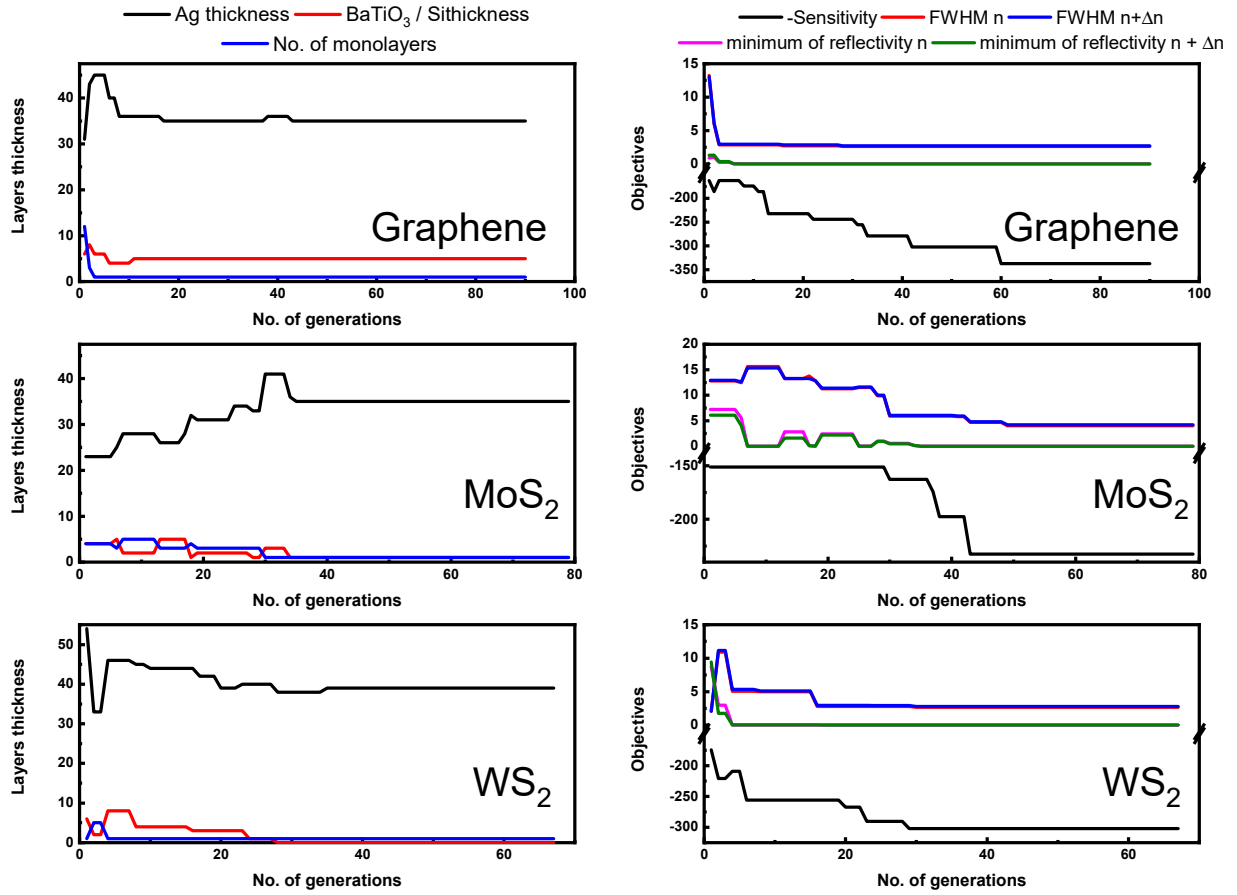


Figure S7: Convergence plots for the Ag-BaTiO₃/Si-2D material-Sensing medium configuration with -sensitivity, FWHM, and minimum of reflectivity as objectives; Left column: the layers thicknesses convergence and right column: the objectives convergence

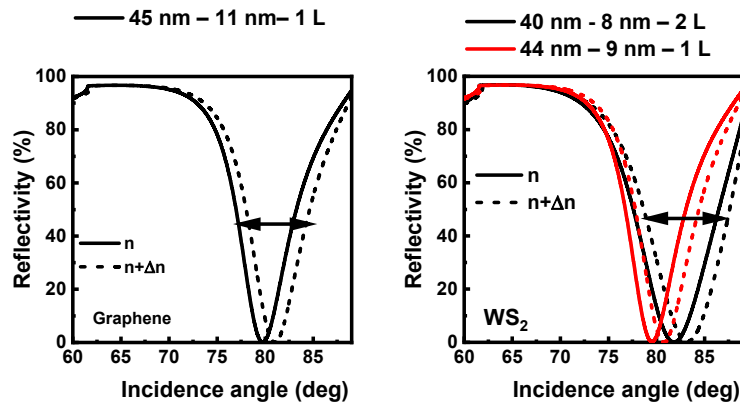


Figure S8: Reflectivity curves for the Convergence plots for the Ag-BaTiO₃/Si-2D material-Sensing medium configuration with -sensitivity, FWHM, and minimum of reflectivity as objectives

Table S4: Additional configurations for the structure: Ag-BaTiO₃-2D material-Sensing medium

L.N.	Material	Configuration: Ag – BaTiO ₃ /Si – 2D material -sensing medium	Sensitivity [deg/RIU]	FWHM [deg]
1	Graphene	45 nm – 11 nm– 1 L (BaTiO ₃)	250	6.1
2		44 nm – 11 nm– 1 L (BaTiO ₃)	235	6.3
3	MoS ₂	-	-	-
4		-	-	-
5	WS ₂	40 nm - 8 nm – 2 L (BaTiO ₃)	270	8.66
6		44 nm – 9 nm – 1 L (BaTiO ₃)	240	6.5