

## Supplementary information

# Depth profiling of ion-implanted 4H-SiC using confocal Raman spectroscopy

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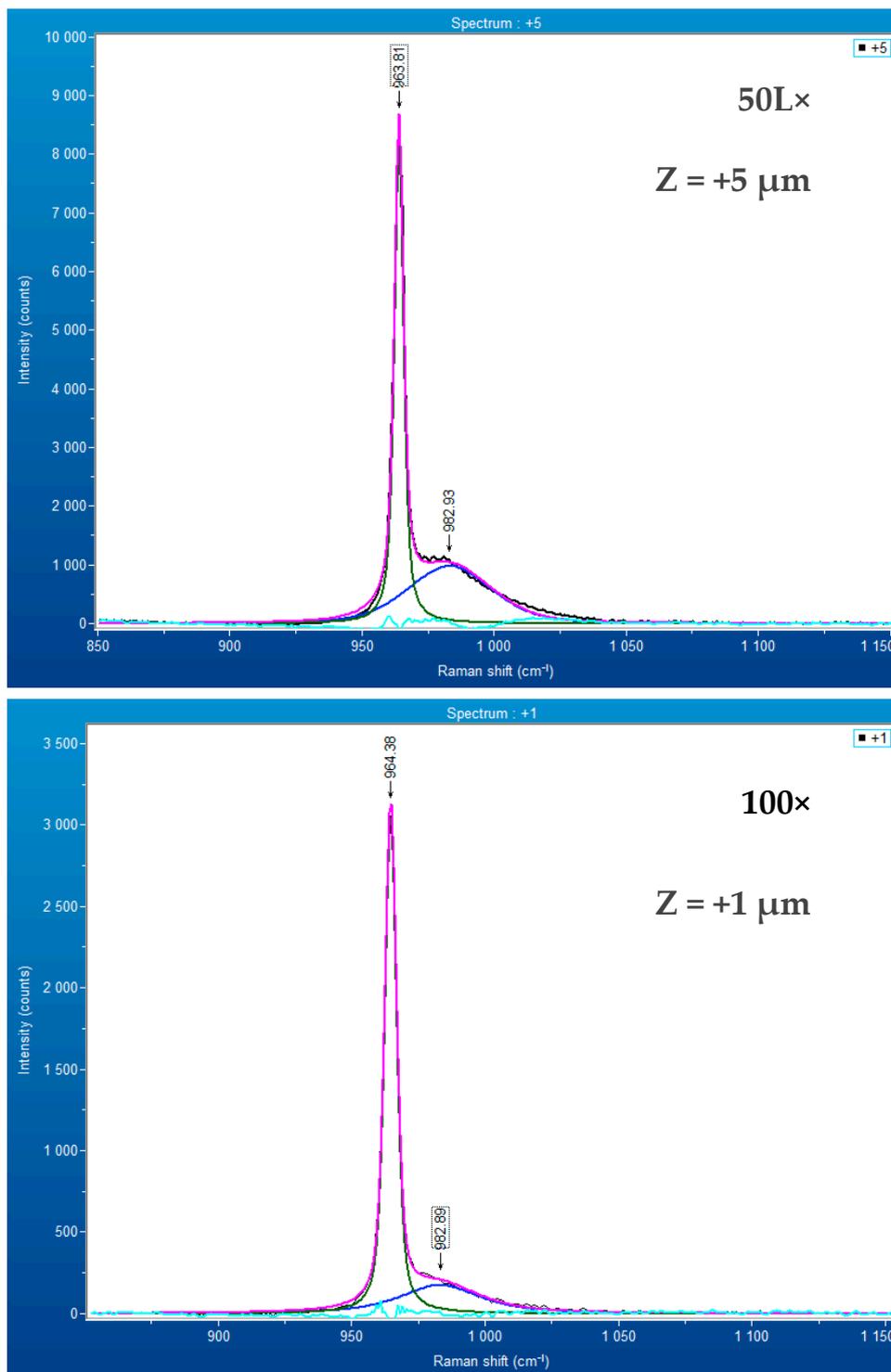
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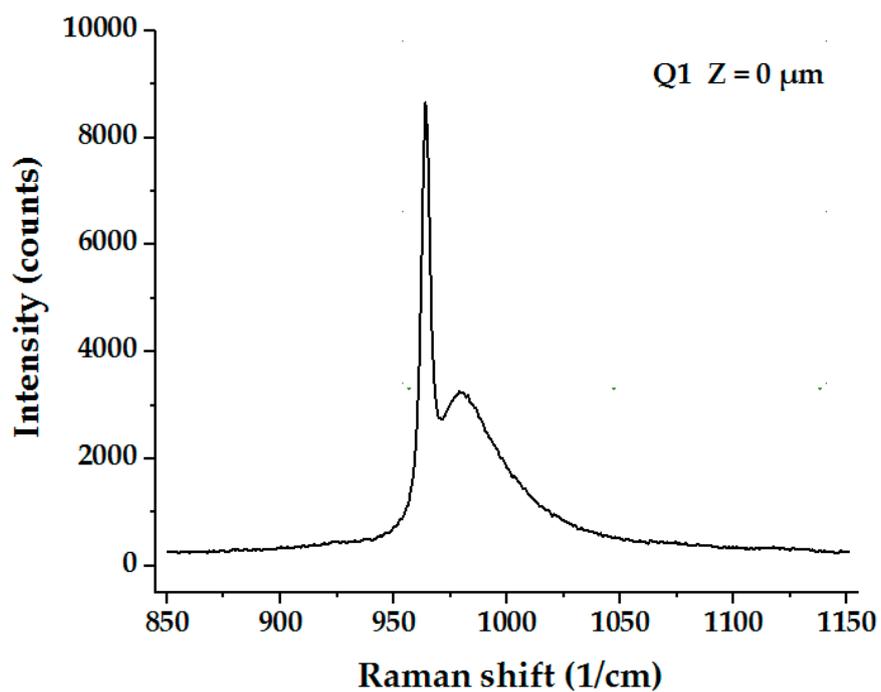
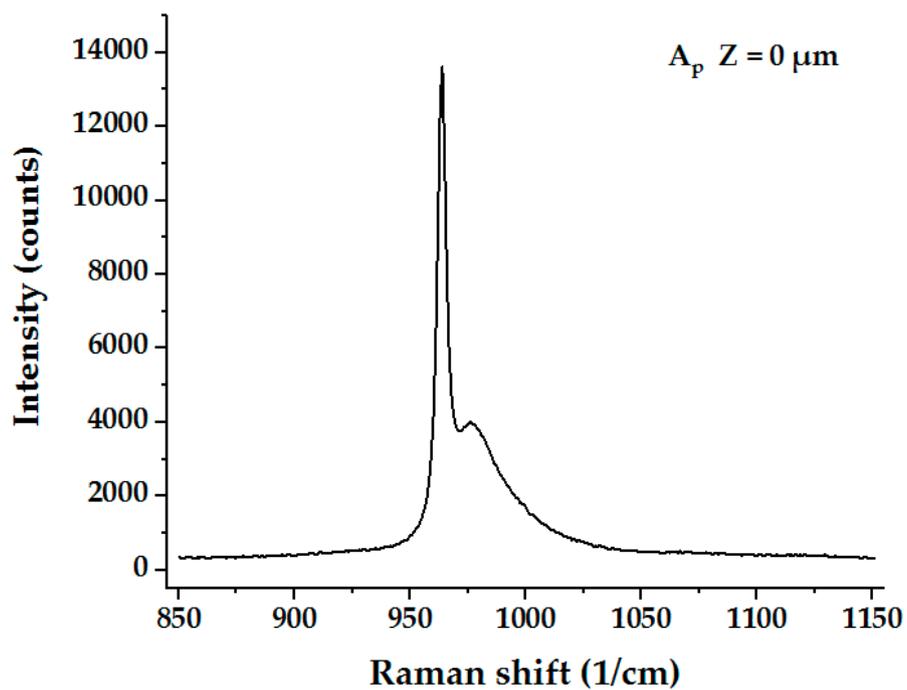
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The fitting results of 50L× lens at +5 μm and 100× lens at +1 μm are shown below. The black lines are the original spectra, the green and blue lines are the LO and LOPC peaks after fitting process with Gauss-Lorentz function.



**Figure S1.** The fitting results of 50L× lens at +5 μm and 100× lens at +1 μm are shown below. The black lines are the original spectra, the green and blue lines are the LO and LOPC peaks after fitting process with Gauss-Lorentz function.

The spectra and the fitting error (with respect to the peak positions) of sample A<sub>p</sub>, Q1 and B2 are shown below.



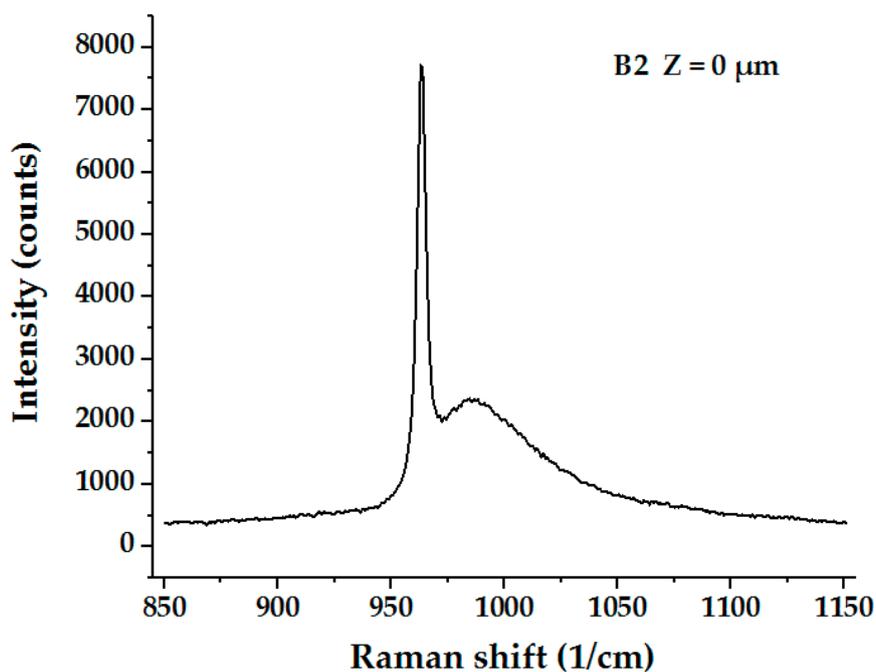


Figure S2. The spectra of sample A<sub>p</sub>, Q1 and B2.

Table S1. Fitting error (with respect to the peak positions) of sample A<sub>p</sub>, Q1 and B2 when Z = 0.

(focusing on surface of the sample)

Sample	Standard error of LOPC mode position (cm <sup>-1</sup> )	Standard error of LO mode position (cm <sup>-1</sup> )	Coefficient of determination (R <sup>2</sup> )
A <sub>p</sub>	0.21	0.01	0.997
Q1	0.23	0.02	0.992
B2	0.39	0.02	0.989

Detailed fitting results for samples A<sub>p</sub>, Q1 and B2 using Origin 2020 software.

Fitting report of **A<sub>p</sub>**

Peak Fit (Gaussian\_LorenCross) (2020/2/11 17:28:37)

## Parameters

		Value	Shared	Standard Error	t-Value	Prob> t	Dependency
Peak1(Gaussian_LorenCross)	y0	63.47283	0	14.22825	4.46104	1.13648E-5	0.86278
	xc	963.72989	0	0.01259	76517.9553	0	0.02919
	A	11641.28881	0	97.79851	119.03339	6.32694E-264	0.72215
	w	1.99894	0	0.02072	96.47265	6.01644E-236	0.68625
	s	0.83863	0	0.02031	41.28341	4.00976E-129	0.61938
Peak2(Gaussian_LorenCross)	y0	63.47283	0	14.22825	4.46104	1.13648E-5	0.86278
	xc	978.33756	0	0.20979	4663.34285	0	0.71241
	A	3530.52807	0	33.37706	105.77708	3.62866E-248	0.67456
	w	14.82902	0	0.22446	66.06486	1.24163E-186	0.75864
	s	0.96038	0	0.01845	52.04949	9.2268E-157	0.83414

Reduced Chi-sqr = 9000.18516171

COD(R<sup>2</sup>) = 0.99669680442719

Iterations Performed = 22

Total Iterations in Session = 22

Fit converged. Chi-Sqr tolerance value of 1E-6 was reached.

Note: The peak centers were fixed for the first 20 iterations. This can be controlled using the @PFFC system variable.

Standard Error was scaled with square root of reduced Chi-Sqr.

## Statistics

	B
Number of Points	324
Degrees of Freedom	315
Reduced Chi-Sqr	9000.18516
Residual Sum of Squares	2835058.32594
R-Square (COD)	0.9967
Adj. R-Square	0.99661
Fit Status	Succeeded(100)

Fit Status Code :

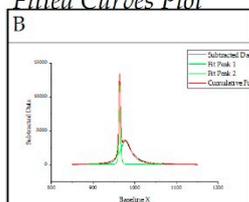
100 : Fit converged. Chi-Sqr tolerance value of 1E-6 was reached.

Note: The peak centers were fixed for the first 20 iterations. This can be controlled using the @PFFC system variable.

## ANOVA

		DF	Sum of Squares	Mean Square	F Value	Prob>F
B	Regression	8	8.55442E8	1.0693E8	11880.90012	0
	Residual	315	2835058.32594	9000.18516		
	Uncorrected Total	324	1.03405E9			
	Corrected Total	323	8.58277E8			

## Fitted Curves Plot



## Fitting report of Q1

Peak Fit (Gaussian\_LorenCross) (2020/2/12 12:29:46)

### Parameters

		Value	Shared	Standard Error	t-Value	Prob> t	Dependency
Peak1(Gaussian_LorenCross)	y0	46.91213	0	18.46917	2.54002	0.01156	0.90226
	xc	964.12525	0	0.02237	43100.93755	0	0.01029
	A	7021.38745	0	95.29698	73.67901	1.19402E-200	0.65052
	w	1.97205	0	0.03163	62.34228	2.924E-179	0.5913
	s	0.76073	0	0.03702	20.55058	3.98062E-60	0.47044
Peak2(Gaussian_LorenCross)	y0	46.91213	0	18.46917	2.54002	0.01156	0.90226
	xc	982.55672	0	0.22919	4287.06245	0	0.47999
	A	2905.68636	0	36.36367	79.90631	3.46512E-211	0.7312
	w	18.12249	0	0.31379	57.7534	1.21941E-169	0.7358
	s	0.94967	0	0.02674	35.52119	3.44E-112	0.85417

Reduced Chi-sqr = 10802.5250203

COD(R<sup>2</sup>) = 0.99198220134649

Iterations Performed = 16

Total Iterations in Session = 16

Fit converged. Chi-Sqr tolerance value of 1E-6 was reached.

Note: The peak centers were fixed for the first 20 iterations. This can be controlled using the @PFFC system variable.

Standard Error was scaled with square root of reduced Chi-Sqr.

### Statistics

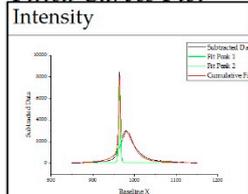
	Intensity
Number of Points	324
Degrees of Freedom	315
Reduced Chi-Sqr	10802.52502
Residual Sum of Squares	3402795.38139
R-Square (COD)	0.99198
Adj. R-Square	0.99178
Fit Status	Succeeded(100)

Fit Status Code :

100 : Fit converged. Chi-Sqr tolerance value of 1E-6 was reached.

Note: The peak centers were fixed for the first 20 iterations. This can be controlled using the @PFFC system variable.

### Fitted Curves Plot



Fitting report of **B2**

Peak Fit (Gaussian\_LorenCross) (2020/2/12 11:56:0)

## Parameters

		Value	Shared	Standard Error	t-Value	Prob> t	Dependency
Peak1(Gaussian_LorenCross)	y0	58.08512	0	25.38727	2.28796	0.0228	0.95132
	xc	963.50163	0	0.02361	40814.11495	0	0.00421
	A	6605.49355	0	88.19016	74.90057	8.88334E-203	0.62203
	w	2.04807	0	0.03432	59.68204	9.27853E-174	0.58229
	s	0.85578	0	0.03001	28.512	2.96643E-89	0.46578
Peak2(Gaussian_LorenCross)	y0	58.08512	0	25.38727	2.28796	0.0228	0.95132
	xc	991.20417	0	0.38895	2548.38977	0	0.42579
	A	1927.70363	0	38.17159	50.501	4.5285E-153	0.84845
	w	27.25966	0	0.6606	41.26527	4.50701E-129	0.81669
	s	0.90457	0	0.05247	17.23923	2.27579E-47	0.89288

Reduced Chi-sqr = 10166.0610398

COD(R<sup>2</sup>) = 0.98904192013658

Iterations Performed = 19

Total Iterations in Session = 19

Fit converged. Chi-Sqr tolerance value of 1E-6 was reached.

Note: The peak centers were fixed for the first 20 iterations. This can be controlled using the @PFFC system variable.

Standard Error was scaled with square root of reduced Chi-Sqr.

## Statistics

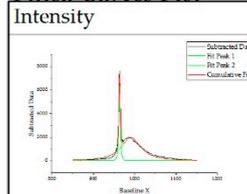
	Intensity
Number of Points	324
Degrees of Freedom	315
Reduced Chi-Sqr	10166.06104
Residual Sum of Squares	3202309.22752
R-Square (COD)	0.98904
Adj. R-Square	0.98876
Fit Status	Succeeded(100)

Fit Status Code :

100 : Fit converged. Chi-Sqr tolerance value of 1E-6 was reached.

Note: The peak centers were fixed for the first 20 iterations. This can be controlled using the @PFFC system variable.

## Fitted Curves Plot

Figure S3. Detailed fitting results for samples A<sub>p</sub>, Q1 and B2 (Origin 2020).

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