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SUPPORTING INFORMATION

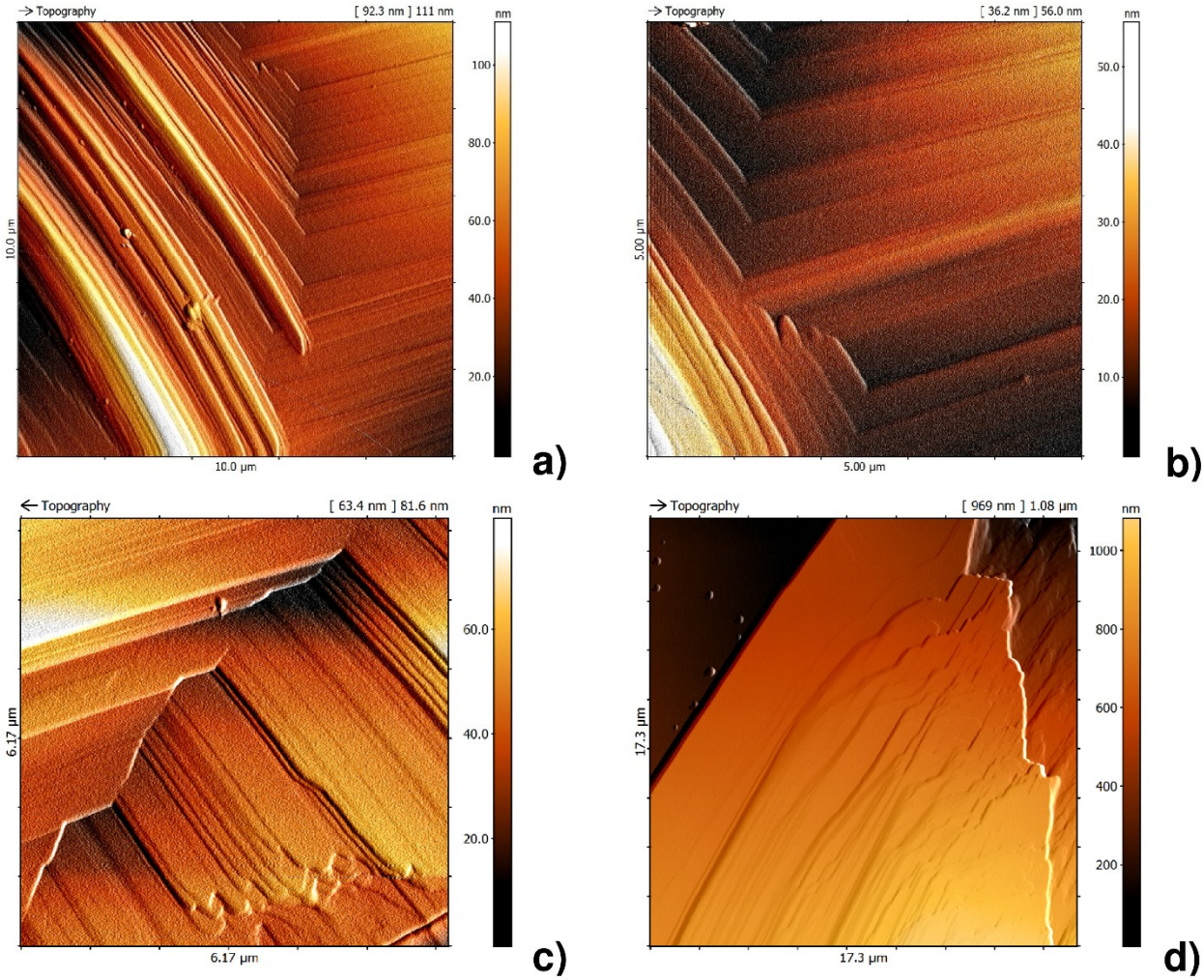

Figure S1. AFM images of the $\bar{1}01$ twins. From a) to c) the twin plane is identified by a broken line. In a) the crystals from the left individual overstep the twin plane. In b) and c) many elongated nuclei of gypsum are growing from the twin plane toward the end of the crystal, which takes on a "leaf-like" appearance.

	Host crystal (calcite) **form {10.4}**	**Guest crystal** (gypsum) **form {010}**	**Misfit** (Δ%)	**Notes**
	Cell vectors	**Cell vectors**		
(1)	$^{1}/_{3}[4\bar{1}\bar{1}]$ = 9.516	$[10\bar{1}]$ =9.941	+4.46	
	3×[010] = 14.969	[301] =15.4615	+3.29	
Area (Å^2) and 2D-cell multiplicity	121.292 (3×)	128.339 (4×)	***+5.81***	Linear misfits in the same sense
(2)	$^{1}/_{3}[4.11.\bar{1}]$= 17.02	3×[100] =16.89	-0.77	
	$^{1}/_{3}[4\bar{4}\bar{1}]$ =12.855	2×[001] =12.46	-3.17	
Area (Å^2) and 2D-cell multiplicity	202.15 (5×)	192.55 (6×)	***-4.98***	Linear misfits in the same sense
(3)	$^{1}/_{3}[81\bar{2}]$= 16.95	3×[100] =16.89	-0.39	
	$^{1}/_{3}[48\bar{1}]$= 12.855	-2×[001] =12.46	-3.17	
Area (Å^2) and 2D-cell multiplicity	202.15 (5×)	192.55 (6×)	***-4.98***	Linear misfits in the same sense
(4)	$[46\bar{1}]$=31.452	[601]=31.781	+1.04	
	2×[010] =9.979	$[10\bar{1}]$ =9.941	-0.39	
Area (Å^2) and 2D-cell multiplicity	242.584 (6×)	234.68 (7×)	***-3.36***	Opposite linear misfits
(5)	$^{1}/_{3}[8.13.\bar{2}]$= 22.06	4×[100] =22.52	+2.08	
	$^{2}/_{3}[42\bar{1}]$=16.206	[302]=16.452	+1.52	
Area (Å^2) and 2D-cell multiplicity	242.584 (6×)	256.736 (8×)	***+5.84***	Linear misfits in the same sense
(6)	$^{1}/_{3}[87\bar{2}]$=16.957	3×[100] =16.89	-0.395	
	$^{1}/_{3}[4\bar{7}1]$=17.021	[203]=17.50	+2.81	
Area (Å^2) and 2D-cell multiplicity	283.015 (7×)	288.828 (9×)	***+2.05***	Opposite linear misfits
(7)	$[44\bar{1}]$=26.277	$[40\bar{1}]$=25.675	-2.34	
	$^{1}/_{3}[4\bar{4}\bar{1}]$ =12.855	2×[101] =12.992	+1.07	
Area (Å^2) and 2D-cell multiplicity	323.44 (8×)	320.92 (10×)	***-0.79***	Opposite linear misfits

(8)	$[4\bar{2}\bar{1}]$ =26.277	$[40\bar{1}]$=25.675	-2.34	
	$^{2}/_{3}$ $[45\bar{1}]$=19.032	-3×[001] =18.69	-1.83	
Area (Å^2) and 2D-cell multiplicity	404.307 (10×)	385.104 (12×)	***-4.99***	Linear misfits in the same sense
(9)	$[41\bar{1}]$=24.816	$[40\bar{1}]$=25.675	+3.46	
	$^{1}/_{3}$ $[4.11.\bar{1}]$=17.02	–[103]=17.207	+1.09	
Area (Å^2) and 2D-cell multiplicity	404.307 (10×)	417.196 (13×)	***+3.19***	Linear misfits in the same sense
(10)	$[4\bar{1}\bar{1}]$=24.816	$[30\bar{2}]$=24.706	–0.44	
	$^{1}/_{3}$ $[4.11.\bar{1}]$=17.02	–[203]=17.50	+2.81	
Area (Å^2) and 2D-cell multiplicity	404.307 (10×)	417.196 (13×)	***+3.19***	Opposite linear misfits
(11)	$[44\bar{1}]$=26.277	[501]=26.262	–0.06	
	$^{1}/_{3}[4\bar{7}\bar{1}]$ =17.021	[103]=17.207	+1.093	
Area (Å^2) and 2D-cell multiplicity	444.738 (11×)	449.288 (14×)	***+1.02***	Opposite linear misfits
(12)	$^{2}/_{3}$ $[4\bar{1}\bar{1}]$=19.032	3×[101] =19.489	+2.40	
	$^{1}/_{3}$ $[4.17.\bar{1}]$=26.231	$[20\bar{3}]$=25.415	–3.21	
Area (Å^2) and 2D-cell multiplicity	485.168 (12×)	481.38 (15×)	***–0.787***	Opposite linear misfits

Table S1. Coincidence cells between gypsum (010) and calcite $(10\bar{1}4)$.