

Electronic Supporting Information: Diffusion-driven growth of calcium carbonate polymorphs in microchannels

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S1 Raman spectra of calcite and vaterite crystals

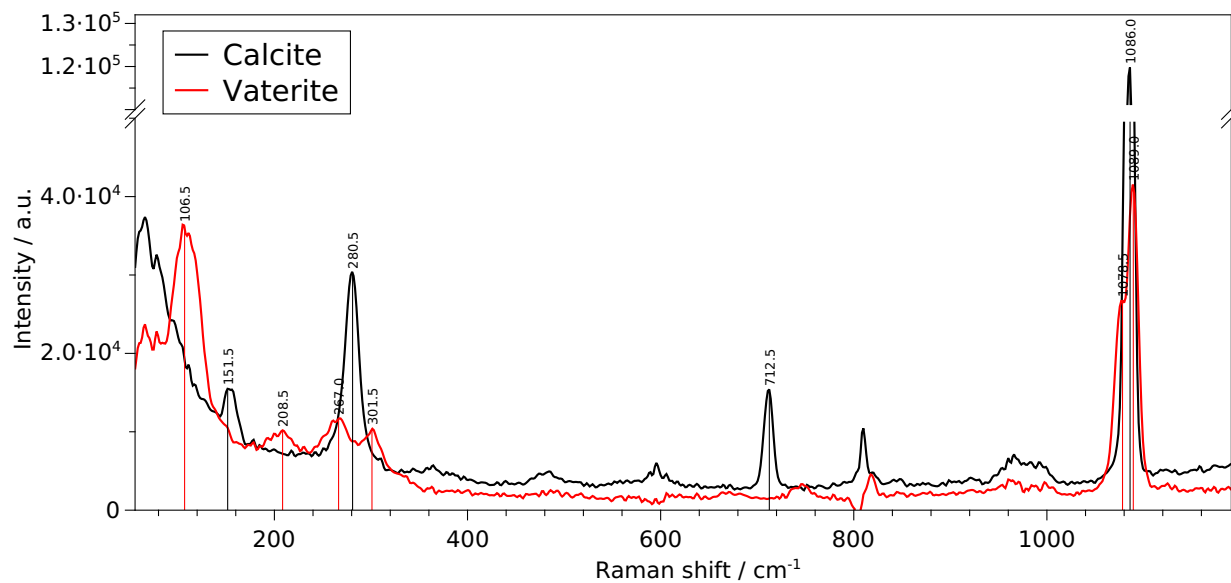


Figure S1: The Raman spectra of the calcite and vaterite crystals. The measurements were carried out by a SENTERRA II Compact Raman microscope, using a 785 nm laser excitation wavelength with a laser power of 100 mW. Five spectra were averaged with the integration time set to 20 s.¹

S2 The surface growth rates of the particles

Table S1: The surface growth rates of the calcite particles at $[\text{Ca}^{2+}]:[\text{CO}_3^{2-}] = 2:2$ ratio. The first number indicates the number of the experiment, the second one the investigated particle

Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$
1.1.	19.96 ± 0.20	2.1.	12.10 ± 0.53	3.1.	3.32 ± 0.03
1.2.	14.86 ± 0.45	2.2.	10.06 ± 0.20	3.2.	10.19 ± 0.06
1.3.	1.26 ± 0.01	2.3.	8.15 ± 0.13	3.3.	7.23 ± 0.23
1.4.	11.24 ± 0.10	2.4.	4.54 ± 0.03	3.4.	7.92 ± 0.07
1.5.	2.78 ± 0.03	2.5.	4.36 ± 0.11	3.5.	2.40 ± 0.04
1.6.	7.40 ± 0.07	2.6.	7.75 ± 0.10	3.6.	8.81 ± 0.15
1.7.	6.27 ± 0.13	2.7.	10.95 ± 0.26	3.7.	3.90 ± 0.06
1.8.	4.00 ± 0.06	2.8.	3.62 ± 0.03	3.8.	7.41 ± 0.13
		2.9.	5.40 ± 0.03	3.9.	2.49 ± 0.02
				3.10.	1.02 ± 0.05

Table S2: The surface growth rates of calcite particles at $[\text{Ca}^{2+}]:[\text{CO}_3^{2-}] = 1:2$ ratio. The first number indicates the number of the experiment, the second one the investigated particle

Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$
1.1.	8.22 ± 0.07	2.1.	10.94 ± 0.16	3.1.	15.40 ± 0.11
1.2.	23.85 ± 0.19	2.2.	10.92 ± 0.13	3.2.	16.97 ± 0.19
1.3.	9.93 ± 0.08	2.3.	18.73 ± 0.13	3.3.	17.02 ± 0.25
1.4.	2.42 ± 0.07	2.4.	5.72 ± 0.06	3.4.	9.86 ± 0.07
1.5.	4.04 ± 0.03	2.5.	4.66 ± 0.05	3.5.	19.00 ± 0.24
1.6.	7.63 ± 0.08	2.6.	5.89 ± 0.03	3.6.	7.25 ± 0.03
1.7.	7.25 ± 0.17	2.7.	3.88 ± 0.05	3.7.	1.74 ± 0.01
1.8.	3.34 ± 0.03	2.8.	2.47 ± 0.01	3.8.	5.18 ± 0.04
1.9.	1.72 ± 0.03				

Table S3: The surface growth rates of calcite particles at $[\text{Ca}^{2+}]:[\text{CO}_3^{2-}] = 2:1$ ratio. The first number indicates the number of the experiment, the second one the investigated particle

Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$
1.1.	14.76 ± 0.18	2.1.	11.59 ± 0.09	3.1.	23.50 ± 0.20
1.2.	17.83 ± 0.09	2.2.	12.18 ± 0.13	3.2.	12.27 ± 0.07
1.3.	9.55 ± 0.10	2.3.	16.28 ± 0.12	3.3.	14.04 ± 0.16
1.4.	12.07 ± 0.06	2.4.	13.48 ± 0.06	3.4.	11.60 ± 0.10
1.5.	4.50 ± 0.09	2.5.	7.66 ± 0.08	3.5.	3.76 ± 0.04
1.6.	3.69 ± 0.20	2.6.	23.59 ± 0.25	3.6.	11.25 ± 0.08
1.7.	4.23 ± 0.08	2.7.	5.97 ± 0.27	3.7.	9.05 ± 0.19
1.8.	1.34 ± 0.03	2.8.	19.82 ± 0.59	3.8.	5.36 ± 0.07
1.9.	0.71 ± 0.01	2.9.	15.32 ± 0.66	3.9.	6.35 ± 0.28
1.10.	4.09 ± 0.09	2.10.	9.79 ± 0.04	3.10.	5.67 ± 0.10
1.11.	4.04 ± 0.05	2.11.	14.37 ± 0.17	3.11.	2.72 ± 0.02
		2.12.	3.21 ± 0.02		
		2.13.	9.89 ± 0.26		
		2.14.	8.25 ± 0.62		
		2.15.	5.26 ± 0.19		
		2.16.	4.55 ± 0.23		
		2.17.	2.13 ± 0.04		
		2.18.	2.38 ± 0.04		
		2.19.	4.15 ± 0.06		
		2.20.	6.25 ± 0.07		
		2.21.	1.81 ± 0.06		
		2.22.	2.58 ± 0.05		

Table S4: The surface growth rates of the vaterite particles at $[\text{Ca}^{2+}]:[\text{CO}_3^{2-}] = 2:1$ ratio. The first number indicates the number of the experiment, the second one the investigated particle

Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$	Particle	$100 r_A(\mu\text{m}^2/\text{s})$
1.1.	28.90 ± 0.45	2.1.	15.45 ± 0.13	3.1.	14.19 ± 0.11
1.2.	23.53 ± 0.24	2.2.	3.79 ± 0.06	3.2.	21.84 ± 0.69
1.3.	27.31 ± 0.99	2.3.	6.65 ± 0.67	3.3.	8.98 ± 0.30
1.4.	15.77 ± 0.72	2.4.	9.72 ± 0.91	3.4.	6.36 ± 0.80
1.5.	29.22 ± 1.15			3.5.	6.38 ± 0.32
1.6.	45.43 ± 2.01				
1.7.	31.66 ± 0.54				
1.8.	21.12 ± 1.04				
1.9.	13.99 ± 1.98				
1.10.	11.99 ± 0.39				
1.11.	10.89 ± 1.40				
1.12.	13.12 ± 0.37				
1.13.	12.14 ± 0.44				
1.14.	11.08 ± 0.19				
1.15.	6.56 ± 2.28				
1.16.	10.05 ± 0.19				
1.17.	4.39 ± 0.27				
1.18.	7.52 ± 0.13				
1.19.	2.34 ± 0.14				

S3 The side growth rates of calcite crystals

Table S5: The side growth rates of the calcite crystals in $\mu\text{m}/\text{min}$ at $[\text{Ca}^{2+}]:[\text{CO}_3^{2-}] = 2:2$ ratio. The first number indicates the number of the experiment, the second one the investigated particle

Particle	r_l	r_l	r_l	r_l
1.1.	0.489 ± 0.015	-	0.645 ± 0.014	0.438 ± 0.013
1.2.	0.186 ± 0.003	0.161 ± 0.017	0.185 ± 0.002	0.213 ± 0.027
1.3.	0.038 ± 0.002	0.050 ± 0.001	0.038 ± 0.002	0.057 ± 0.001
1.4.	0.121 ± 0.001	0.113 ± 0.001	0.114 ± 0.001	0.118 ± 0.002
1.5.	0.056 ± 0.003	0.081 ± 0.003	0.039 ± 0.003	0.094 ± 0.004
1.6.	0.099 ± 0.002	0.100 ± 0.003	0.088 ± 0.002	0.091 ± 0.003
1.7.	0.054 ± 0.003	0.062 ± 0.004	0.060 ± 0.003	0.064 ± 0.003
1.8.	0.043 ± 0.003	0.043 ± 0.004	0.087 ± 0.003	0.026 ± 0.003
2.1.	0.175 ± 0.030	0.182 ± 0.021	0.247 ± 0.021	0.199 ± 0.037
2.2.	0.212 ± 0.006	0.309 ± 0.012	0.180 ± 0.010	0.288 ± 0.009
2.3.	0.204 ± 0.013	0.257 ± 0.012	0.213 ± 0.013	0.242 ± 0.012
2.4.	0.219 ± 0.001	0.121 ± 0.009	0.261 ± 0.010	0.119 ± 0.002
2.5.	0.130 ± 0.007	0.136 ± 0.010	0.124 ± 0.007	0.146 ± 0.008
2.6.	0.282 ± 0.004	0.336 ± 0.006	0.279 ± 0.005	0.318 ± 0.004
2.7.	0.292 ± 0.009	0.208 ± 0.010	0.274 ± 0.012	0.214 ± 0.010
2.8.	0.070 ± 0.002	0.075 ± 0.002	0.062 ± 0.002	0.072 ± 0.002
2.9.	0.061 ± 0.002	0.095 ± 0.004	0.071 ± 0.002	0.086 ± 0.002
3.1.	0.153 ± 0.016	0.144 ± 0.006	0.154 ± 0.007	0.135 ± 0.004
3.2.	0.306 ± 0.013	0.438 ± 0.011	0.329 ± 0.020	0.416 ± 0.008
3.3.	0.197 ± 0.010	0.154 ± 0.008	0.195 ± 0.009	0.133 ± 0.020
3.4.	0.181 ± 0.005	0.137 ± 0.004	0.174 ± 0.004	0.119 ± 0.004
3.5.	0.080 ± 0.005	0.097 ± 0.007	0.101 ± 0.010	0.084 ± 0.003
3.6.	0.132 ± 0.004	0.152 ± 0.004	0.140 ± 0.003	0.169 ± 0.003
3.7.	0.110 ± 0.003	0.092 ± 0.003	0.104 ± 0.004	0.100 ± 0.002
3.8.	0.129 ± 0.003	0.145 ± 0.003	0.116 ± 0.005	0.152 ± 0.004
3.9.	0.057 ± 0.001	0.039 ± 0.001	0.057 ± 0.001	0.039 ± 0.001
3.10.	0.012 ± 0.002	0.040 ± 0.004	0.009 ± 0.002	0.037 ± 0.002

Table S6: The side growth rates of the calcite crystals in $\mu\text{m}/\text{min}$ at $[\text{Ca}^{2+}]:[\text{CO}_3^{2-}] = 1:2$ ratio. The first number indicates the number of the experiment while the second one the examined particle

Particle	r_l	r_l	r_l	r_l
1.1.	0.433±0.013	0.430±0.020	0.476±0.016	0.454±0.013
1.2.	0.868±0.014	0.730±0.020	0.830±0.020	0.813±0.016
1.3.	0.251±0.007	0.300±0.005	0.208±0.005	0.273±0.011
1.4.	0.084±0.010	0.052±0.002	0.094±0.007	0.064±0.002
1.5.	0.074±0.002	0.101±0.003	0.073±0.003	0.125±0.002
1.6.	0.121±0.003	0.115±0.002	0.117±0.002	0.143±0.002
1.7.	0.126±0.002	0.158±0.002	0.104±0.003	0.155±0.002
1.8.	0.055±0.001	0.070±0.002	0.040±0.001	0.043±0.001
1.9.	0.081±0.007	0.055±0.009	0.084±0.004	0.038±0.006
2.1.	0.296±0.004	0.269±0.005	0.284±0.006	0.275±0.004
2.2.	0.381±0.008	0.369±0.010	0.366±0.007	0.386±0.008
2.3.	0.250±0.002	0.286±0.005	0.253±0.002	0.273±0.006
2.4.	0.144±0.003	0.120±0.002	0.122±0.002	0.129±0.002
2.5.	0.122±0.001	0.128±0.003	0.111±0.003	0.130±0.002
2.6.	0.120±0.002	0.195±0.004	0.051±0.002	0.059±0.003
2.7.	0.061±0.005	0.092±0.003	0.049±0.003	0.096±0.002
2.8.	0.075±0.002	0.049±0.002	0.086±0.003	0.017±0.001
3.1.	0.272±0.002	0.223±0.002	0.293±0.002	0.261±0.002
3.2.	0.293±0.005	0.190±0.004	0.419±0.011	0.313±0.004
3.3.	0.419±0.005	0.492±0.009	0.468±0.013	0.450±0.007
3.4.	0.151±0.002	0.157±0.014	0.160±0.002	0.178±0.006
3.5.	0.374±0.009	0.288±0.008	0.471±0.014	0.300±0.008
3.6.	0.082±0.001	0.142±0.001	0.098±0.001	0.129±0.001
3.7.	0.050±0.002	0.030±0.002	0.024±0.003	0.050±0.002
3.8.	0.072±0.002	0.123±0.002	0.133±0.005	0.117±0.002

Table S7: The side growth rates of the calcite crystals in $\mu\text{m}/\text{min}$ at $[\text{Ca}^{2+}]:[\text{CO}_3^{2-}] = 2:1$ ratio. The first number indicates the number of the experiment, the second one the investigated particle

Particle	r_l	r_l	r_l	r_l
1.1.	0.220±0.005	0.221±0.003	0.211±0.005	0.226±0.003
1.2.	0.263±0.004	0.270±0.003	0.283±0.003	0.328±0.005
1.3.	0.156±0.003	0.175±0.002	0.146±0.003	0.176±0.002
1.4.	0.213±0.010	0.282±0.008	0.187±0.008	0.284±0.011
1.5.	0.132±0.005	0.101±0.004	0.125±0.004	0.057±0.006
1.6.	0.059±0.006	0.095±0.008	0.073±0.010	0.085±0.007
1.7.	0.149±0.011	0.068±0.005	0.158±0.006	0.051±0.006
1.8.	0.036±0.002	0.043±0.002	0.027±0.002	0.050±0.002
1.9.	0.014±0.001	0.018±0.002	0.022±0.002	0.017±0.002
1.10.	0.042±0.002	0.052±0.002	0.040±0.002	0.055±0.002
1.11.	0.054±0.001	0.046±0.001	0.058±0.002	0.048±0.001
2.1.	0.302±0.004	0.293±0.007	0.311±0.005	0.303±0.008
2.2.	0.277±0.005	0.465±0.007	0.295±0.007	0.479±0.006
2.3.	0.188±0.011	0.290±0.007	0.217±0.010	0.290±0.006
2.4.	0.302±0.014	0.257±0.009	0.297±0.010	0.273±0.009
2.5.	0.244±0.012	0.290±0.007	0.233±0.011	0.309±0.006
2.6.	0.268±0.007	0.396±0.004	0.318±0.018	0.394±0.009
2.7.	0.004±0.018	0.331±0.019	0.066±0.017	0.287±0.020
2.8.	0.270±0.013	0.321±0.016	0.285±0.018	0.340±0.013
2.9.	0.367±0.020	0.259±0.017	0.423±0.016	0.248±0.018
2.10.	0.432±0.036	0.142±0.003	0.371±0.004	0.133±0.006
2.11.	0.285±0.004	0.250±0.005	0.290±0.005	0.249±0.004
2.12.	0.118±0.002	0.132±0.002	0.119±0.002	0.123±0.002
2.13.	0.161±0.014	0.110±0.020	0.171±0.016	0.163±0.033
2.14.	0.068±0.033	0.139±0.020	0.083±0.013	0.168±0.027
2.15.	0.079±0.007	0.177±0.009	0.078±0.007	0.187±0.009
2.16.	0.113±0.008	0.056±0.006	0.074±0.007	0.056±0.005
2.17.	0.036±0.004	0.030±0.002	0.036±0.004	0.028±0.003
2.18.	0.010±0.007	0.156±0.013	0.010±0.008	0.074±0.018
2.19.	0.089±0.004	0.043±0.002	0.081±0.003	0.052±0.003
2.20.	0.073±0.004	0.089±0.003	0.081±0.003	0.087±0.003
2.21.	0.032±0.003	0.030±0.003	0.032±0.002	0.028±0.004
2.22.	0.026±0.003	0.027±0.006	0.032±0.002	0.036±0.002
3.1.	0.593±0.013	0.552±0.010	0.552±0.010	0.606±0.015
3.2.	0.270±0.005	0.286±0.007	0.251±0.007	0.286±0.006
3.3.	0.545±0.011	0.508±0.008	0.555±0.043	0.514±0.010
3.4.	0.190±0.004	0.181±0.003	0.179±0.007	0.191±0.005
3.5.	0.152±0.004	0.066±0.004	0.158±0.005	0.069±0.004
3.6.	0.144±0.003	0.147±0.002	0.141±0.002	0.139±0.003
3.7.	0.111±0.006	0.173±0.004	0.124±0.009	0.181±0.006
3.8.	0.084±0.003	0.070±0.003	0.073±0.002	0.062±0.003
3.9.	0.100±0.004	0.073±0.003	0.074±0.003	0.059±0.002
3.10.	0.059±0.002	0.068±0.003	0.065±0.003	0.060±0.003
3.11.	0.056±0.002	0.049±0.002	0.058±0.002	0.047±0.002

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