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Supporting information for article:

**Evolution of the  $\alpha$ -BaMg(CO<sub>3</sub>)<sub>2</sub> low-temperature superstructure and the tricritical nature of its  $\alpha$ - $\beta$  phase transition**

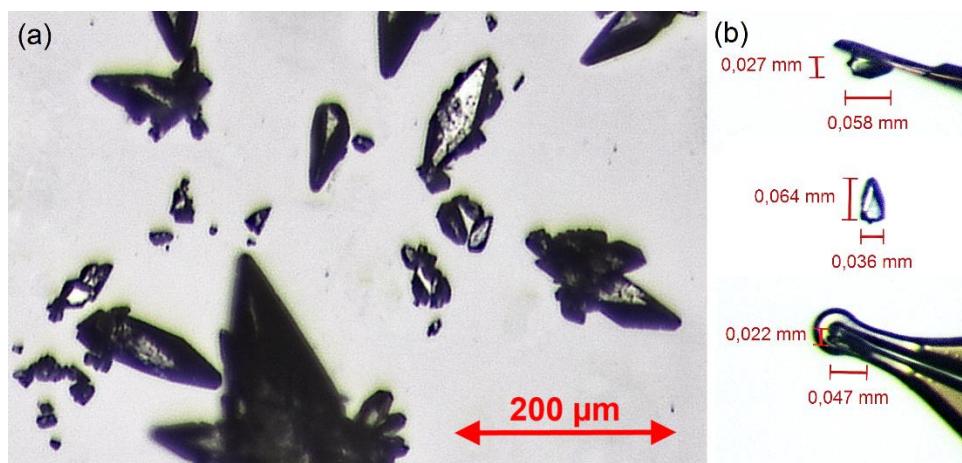
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Supporting information about derived lattice parameters from powder diffraction in the Gandolfi mode of the single-crystal X-ray diffraction device (Table S1) as well as the associated powder pattern (Figure S2) and a picture from the available BaMg(CO<sub>3</sub>)<sub>2</sub> sample crystals (Figure S1) is given in this section. Furthermore, the determination of the average T<sub>c</sub>-value from a box-plot using minimal and maximal determined T<sub>c</sub>-values is shown (Figure S3).

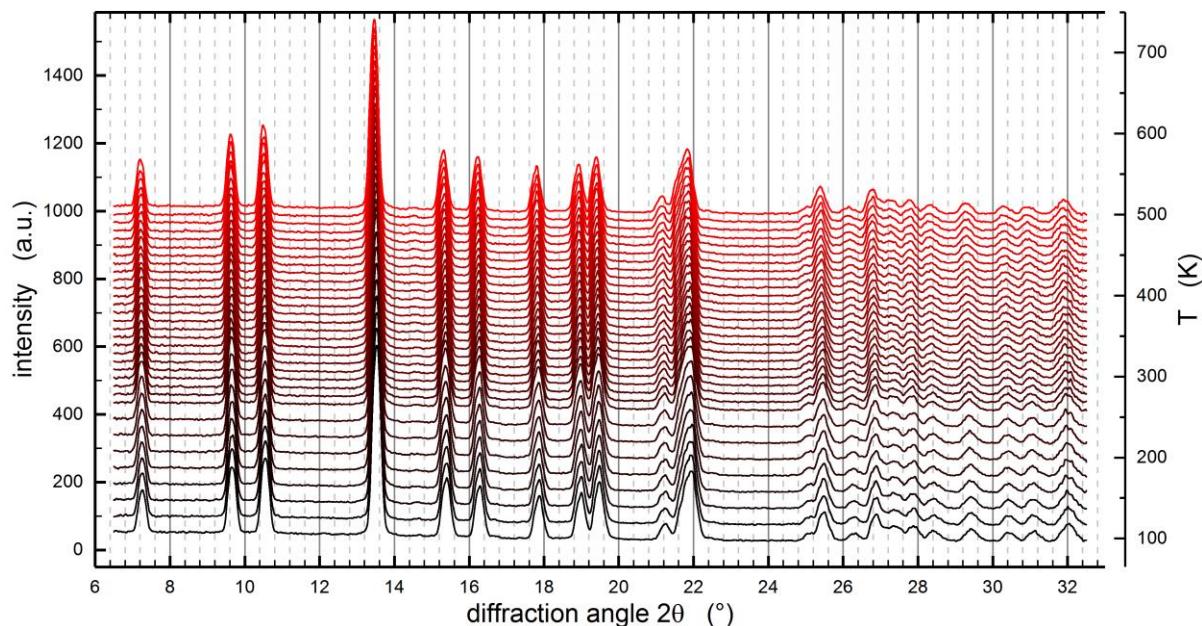
**Table S1** Derived lattice parameters and unit cell volume of BaMg(CO<sub>3</sub>)<sub>2</sub> from powder diffraction measurements with estimated errors from LeBail fits.

T (K)	V (Å)	ΔV (Å)	a (Å)	Δa (Å)	c (Å)	Δc(Å)
100	725.61	0.01	5.0075	8.00E-04	33.414	0.004
120	725.81	0.01	5.0079	8.00E-04	33.418	0.004
140	726.18	0.01	5.0085	8.00E-04	33.427	0.004
160	726.55	0.01	5.0091	8.00E-04	33.436	0.004
180	726.94	0.01	5.0097	8.00E-04	33.446	0.004
200	727.25	0.01	5.0104	8.00E-04	33.451	0.004
220	727.76	0.01	5.0111	8.00E-04	33.465	0.004
240	728.16	0.01	5.0121	8.00E-04	33.470	0.004
260	728.53	0.01	5.0130	8.00E-04	33.475	0.004
270	728.88	0.01	5.0136	8.00E-04	33.483	0.004
280	729.04	0.01	5.0140	8.00E-04	33.485	0.004
290	729.30	0.01	5.0146	8.00E-04	33.489	0.004
300	729.51	0.01	5.0151	8.00E-04	33.492	0.004
310	729.74	0.01	5.0156	8.00E-04	33.496	0.004
320	729.97	0.01	5.0161	8.00E-04	33.500	0.004
330	730.20	0.01	5.0168	8.00E-04	33.501	0.004
340	730.45	0.01	5.0176	8.00E-04	33.502	0.004
350	730.70	0.01	5.0183	8.00E-04	33.504	0.004
360	730.99	0.01	5.0192	8.00E-04	33.505	0.004
370	731.24	0.01	5.0200	8.00E-04	33.506	0.004
380	731.53	0.01	5.0203	8.00E-04	33.515	0.004
390	731.73	0.01	5.0207	8.00E-04	33.519	0.004
400	732.10	0.01	5.0210	8.00E-04	33.532	0.004
410	732.38	0.01	5.0215	8.00E-04	33.538	0.004
420	732.65	0.01	5.0219	8.00E-04	33.545	0.004
430	732.99	0.01	5.0221	8.00E-04	33.558	0.004
440	733.19	0.01	5.0222	8.00E-04	33.566	0.004
450	733.62	0.01	5.0232	8.00E-04	33.572	0.004
460	733.97	0.01	5.0235	8.00E-04	33.584	0.004
470	734.18	0.01	5.0235	8.00E-04	33.594	0.004
480	734.51	0.01	5.0240	8.00E-04	33.602	0.004
490	734.86	0.01	5.0243	8.00E-04	33.614	0.004
500	735.18	0.01	5.0245	8.00E-04	33.626	0.004

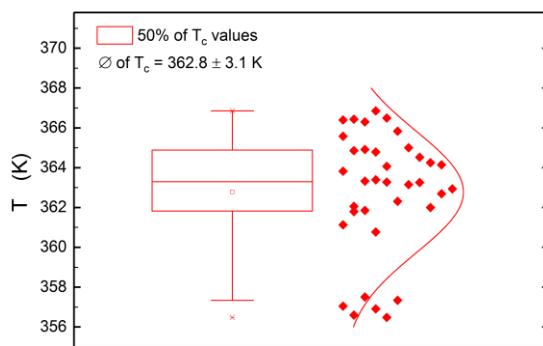
c lattice parameter values below 370 K are multiplied with 2



**Figure S1** (a)  $\text{BaMg}(\text{CO}_3)_2$  sample crystals, (b) the crystal used for the single-crystal X-ray diffraction only reaches 60  $\mu\text{m}$  in length.



**Figure S2** Temperature-dependent powder X-ray diffraction pattern of  $\text{BaMg}(\text{CO}_3)_2$  integrated from area detector with around  $0.015^\circ$  step width.



**Figure S3** Box chart of determined  $T_c$  values including minimal and maximal determined values from powder and single-crystal X-ray diffraction.