

## Supplementary Information

### Various magnetic states for novel layered cobalt oxides $\text{CaCo}_6\text{O}_{11}$ and $\text{BaCo}_6\text{O}_{11}$

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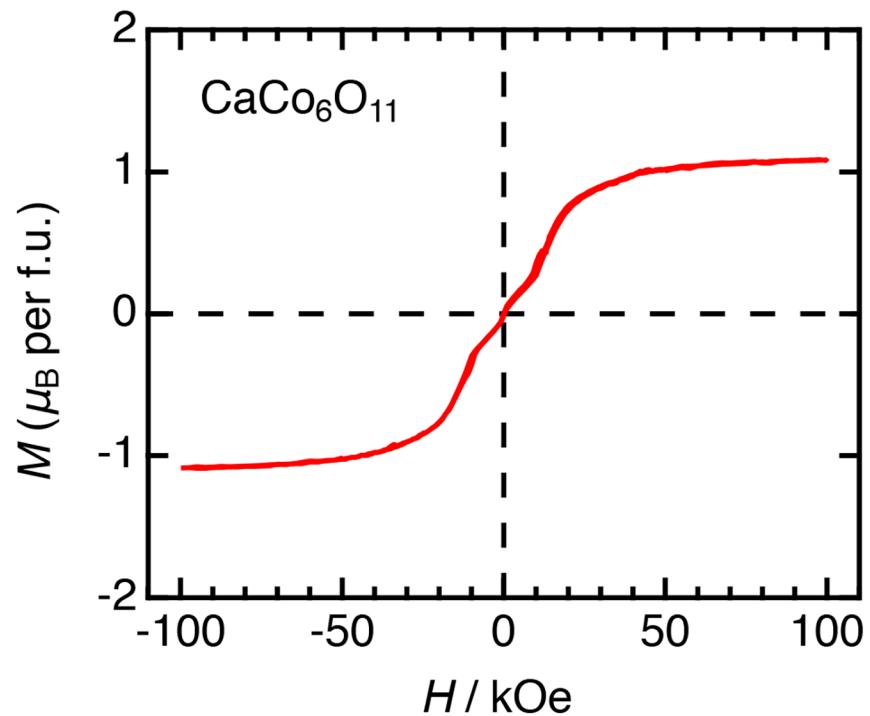
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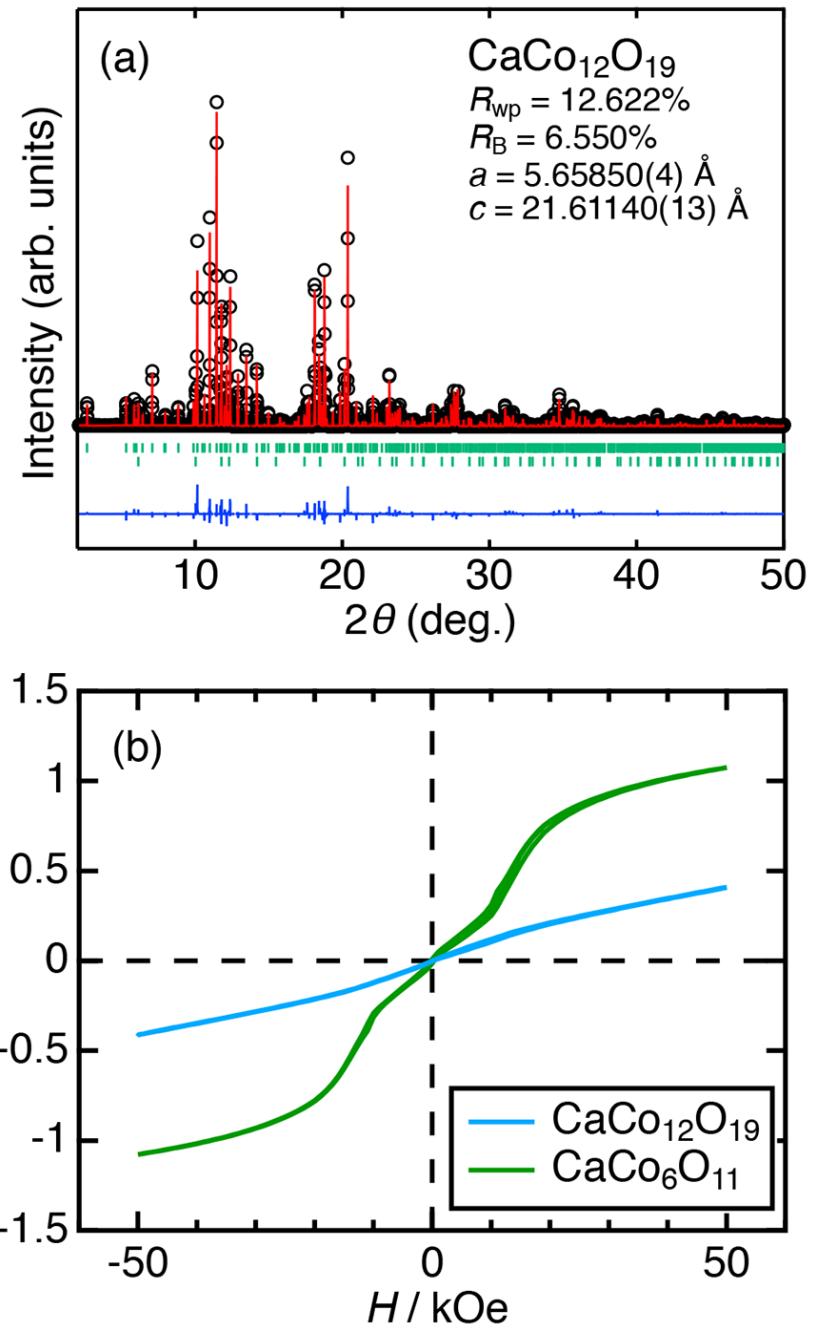
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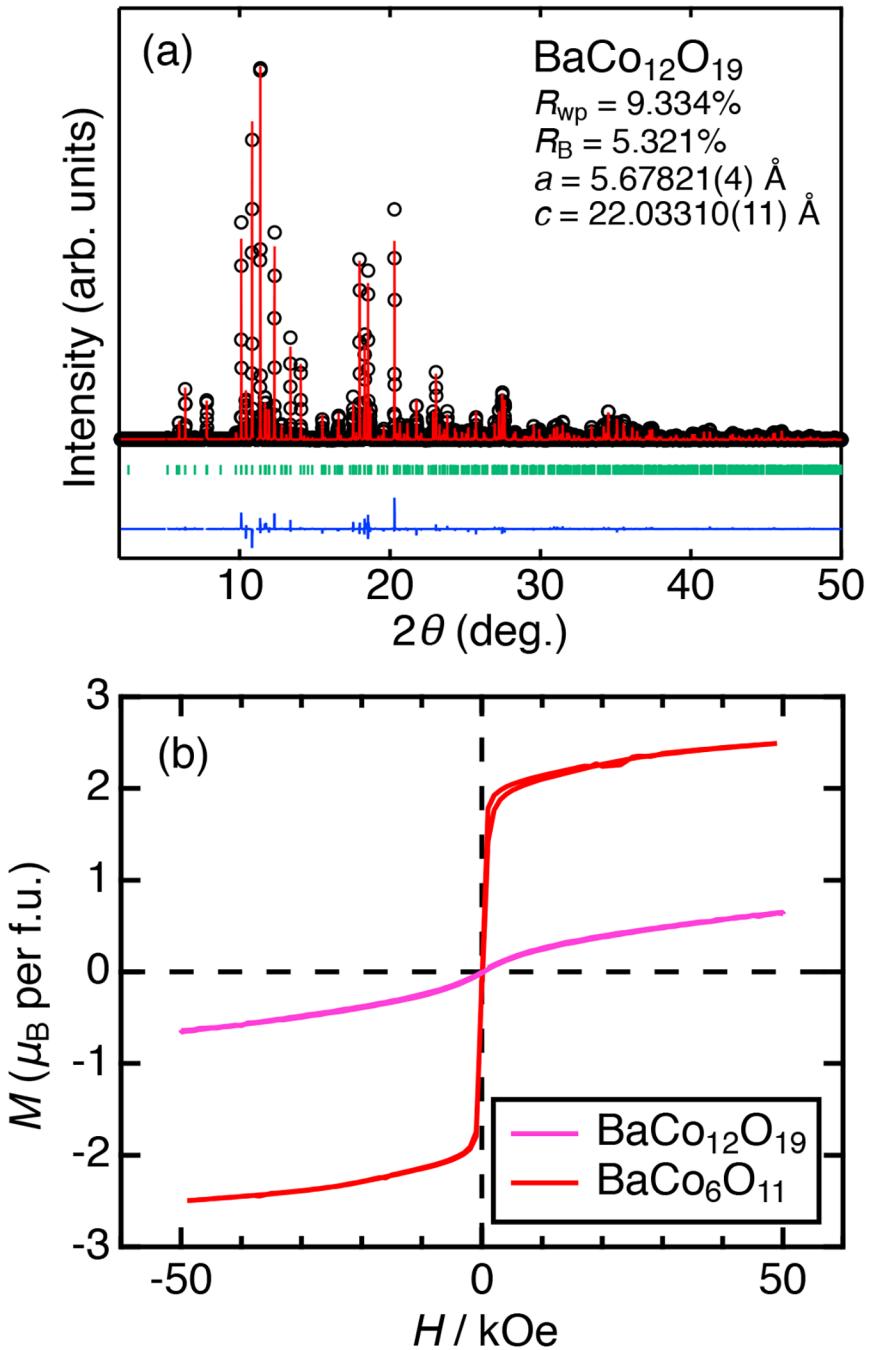
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**Figure S1.** An isothermal magnetization curve measured at 1.8 K for  $\text{CaCo}_6\text{O}_{11}$ . The magnetization almost saturates at  $\sim 1 \mu_B$  above 40 kOe.



**Figure S2.** (a) Observed SXRD patterns and the Rietveld refinement results for  $\text{CaCo}_{12}\text{O}_{19}$ . The circles (black) and solid lines (red) represent observed and calculated patterns, respectively. The difference between the observed and calculated patterns is shown at the bottom (blue). The vertical marks (green) indicate the Bragg reflection positions of  $\text{CaCo}_{12}\text{O}_{19}$  (upper, 87.5 wt%) and  $\text{Co}_3\text{O}_4$  (bottom, 12.5 wt%). The space group was  $P6_3/mmc$ , as well as the isostructural compound  $\text{SrCo}_{12}\text{O}_{19}$ . (b) Isothermal magnetization curves measured at 1.8 K for  $\text{CaCo}_{12}\text{O}_{19}$ . The data for  $\text{CaCo}_6\text{O}_{11}$  measured at 5 K (Figure 6 in the manuscript) are also shown.



**Figure S3.** (a) Observed SXRD patterns and the Rietveld refinement results for  $\text{BaCo}_{12}\text{O}_{19}$ . The circles (black) and solid lines (red) represent observed and calculated patterns, respectively. The difference between the observed and calculated patterns is shown at the bottom (blue). The vertical marks (green) indicate the Bragg reflection positions of  $\text{BaCo}_{12}\text{O}_{19}$ . The space group was  $P6_3/mmc$ , as well as the isostructural compound  $\text{SrCo}_{12}\text{O}_{19}$ . (b) Isothermal magnetization curves measured at 1.8 K for  $\text{BaCo}_{12}\text{O}_{19}$ . The data for  $\text{BaCo}_6\text{O}_{11}$  measured at 5 K (Figure 6 in the manuscript) are also shown.