

Figure S1. Simultaneous thermal analysis with mass-spectrometry of 6T.

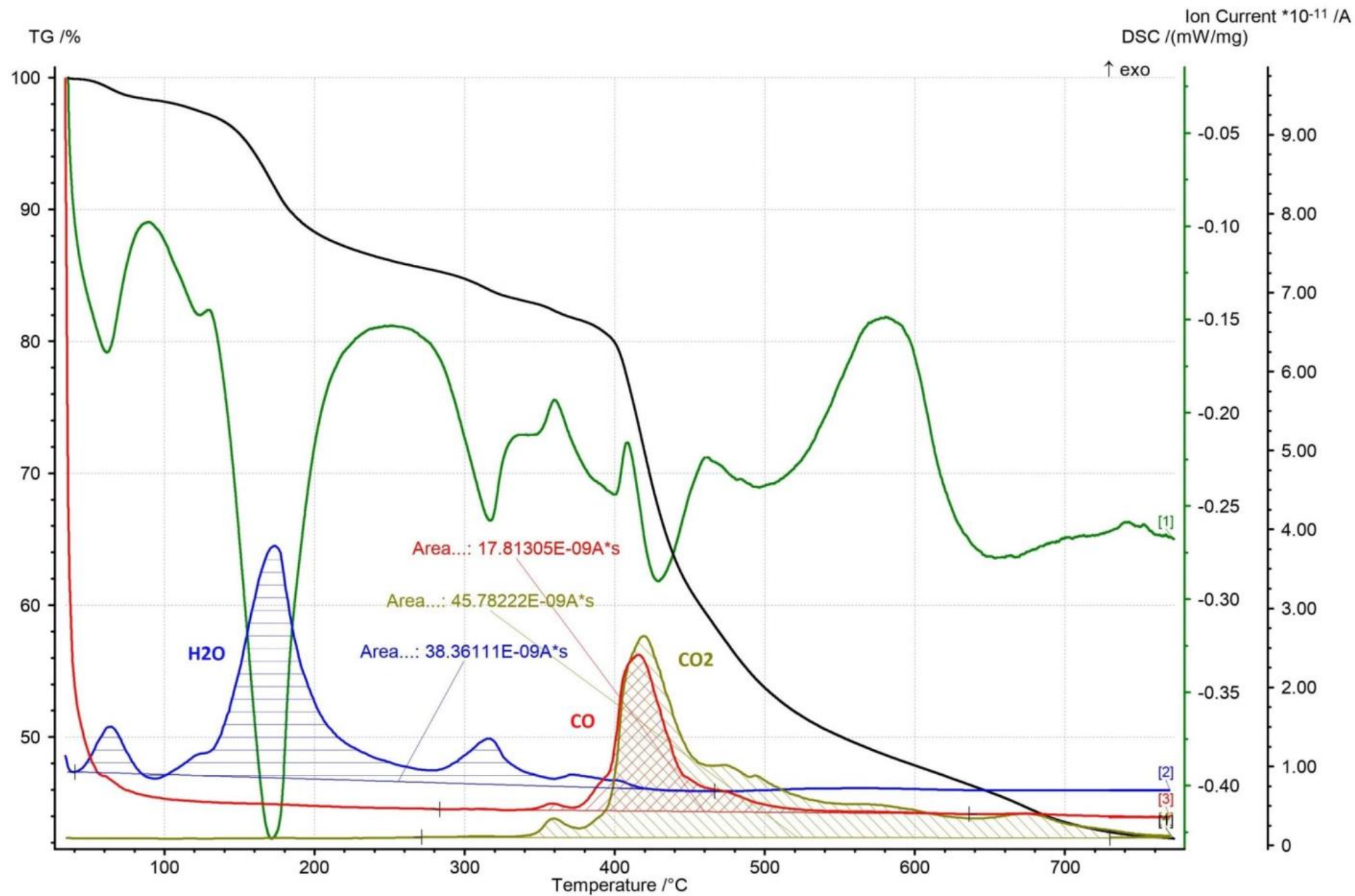


Figure S2. Simultaneous thermal analysis with mass-spectrometry of 6M.

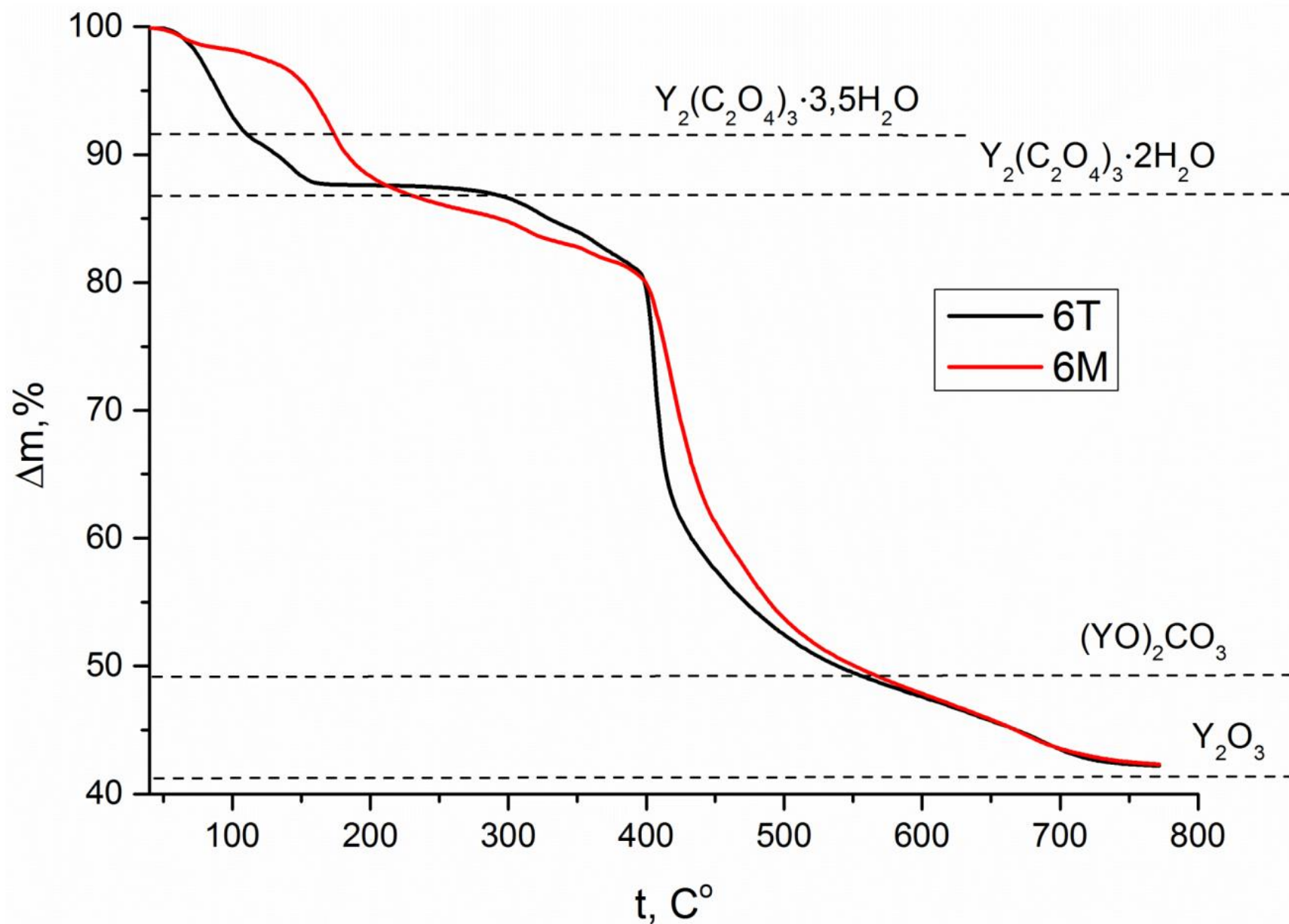


Figure S3. TG curves of 6T and 6M at a specified heating rate of  $3^\circ/\text{min}$  in an argon-oxygen mixture (80%Ar+20%O<sub>2</sub>), (dotted lines show the calculated value of weight loss during the formation of intermediates).



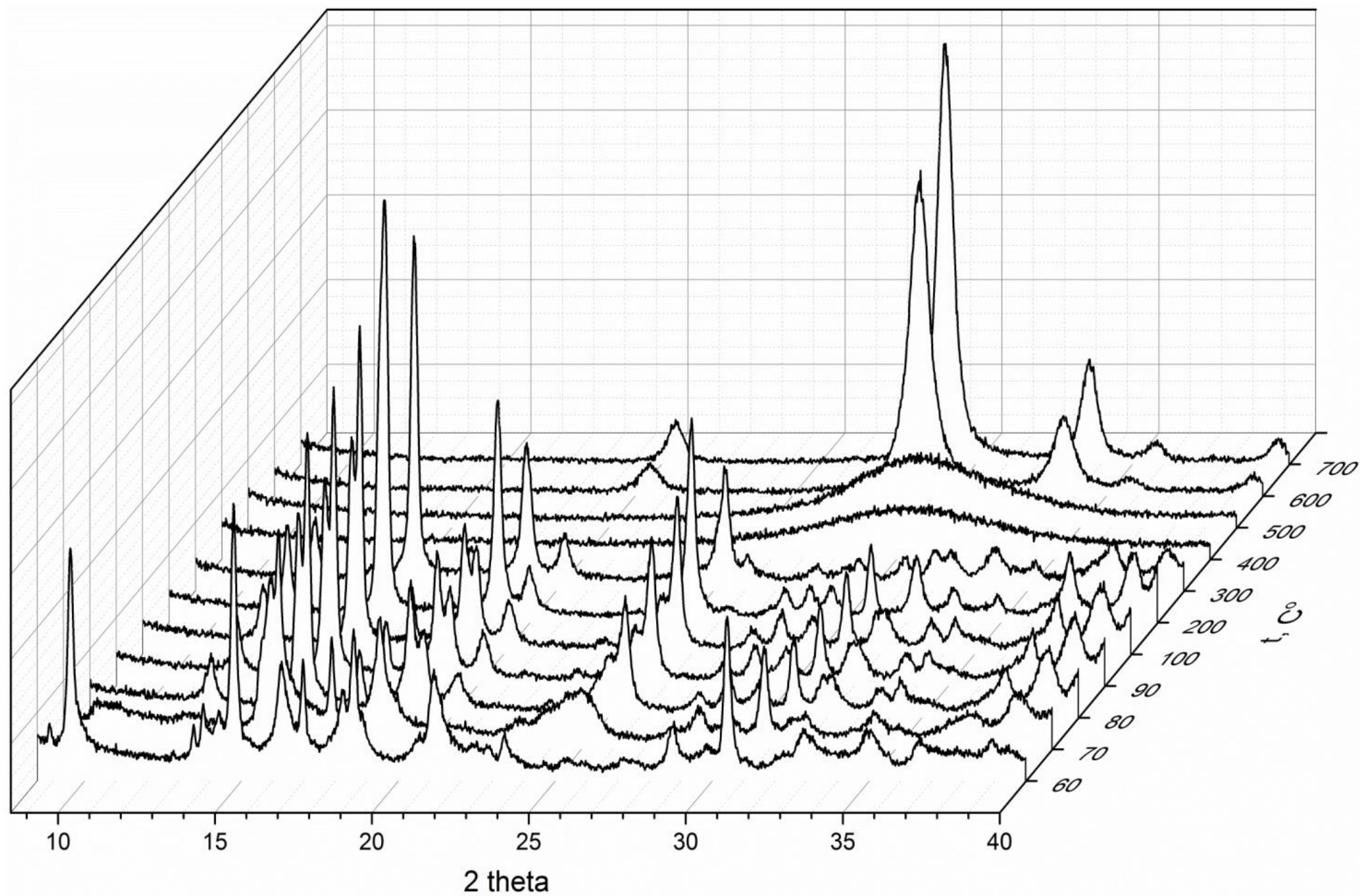


Figure S4. In situ XRD on heating study of 6T.

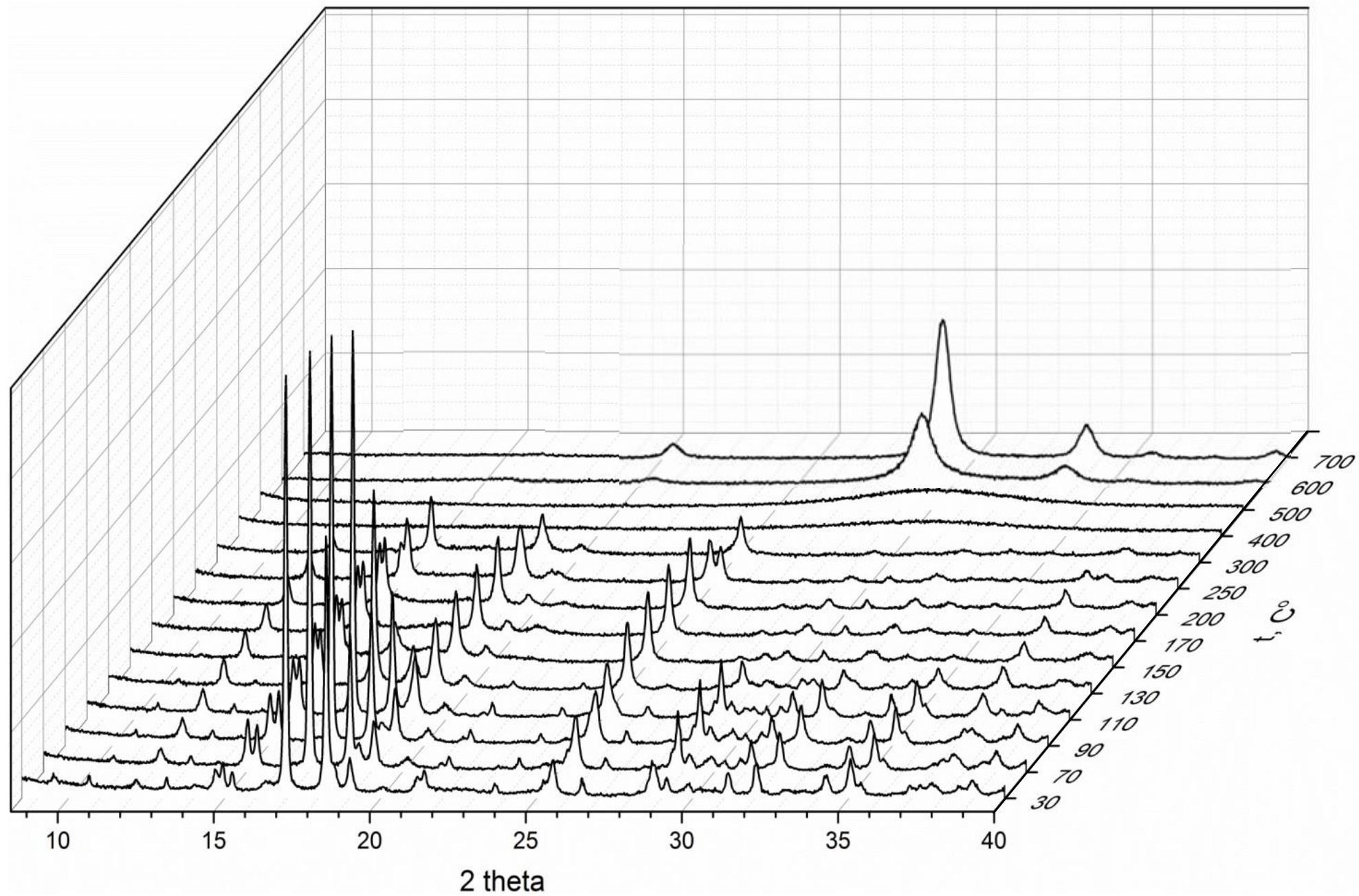


Figure S5. In situ XRD on heating study of 6M.

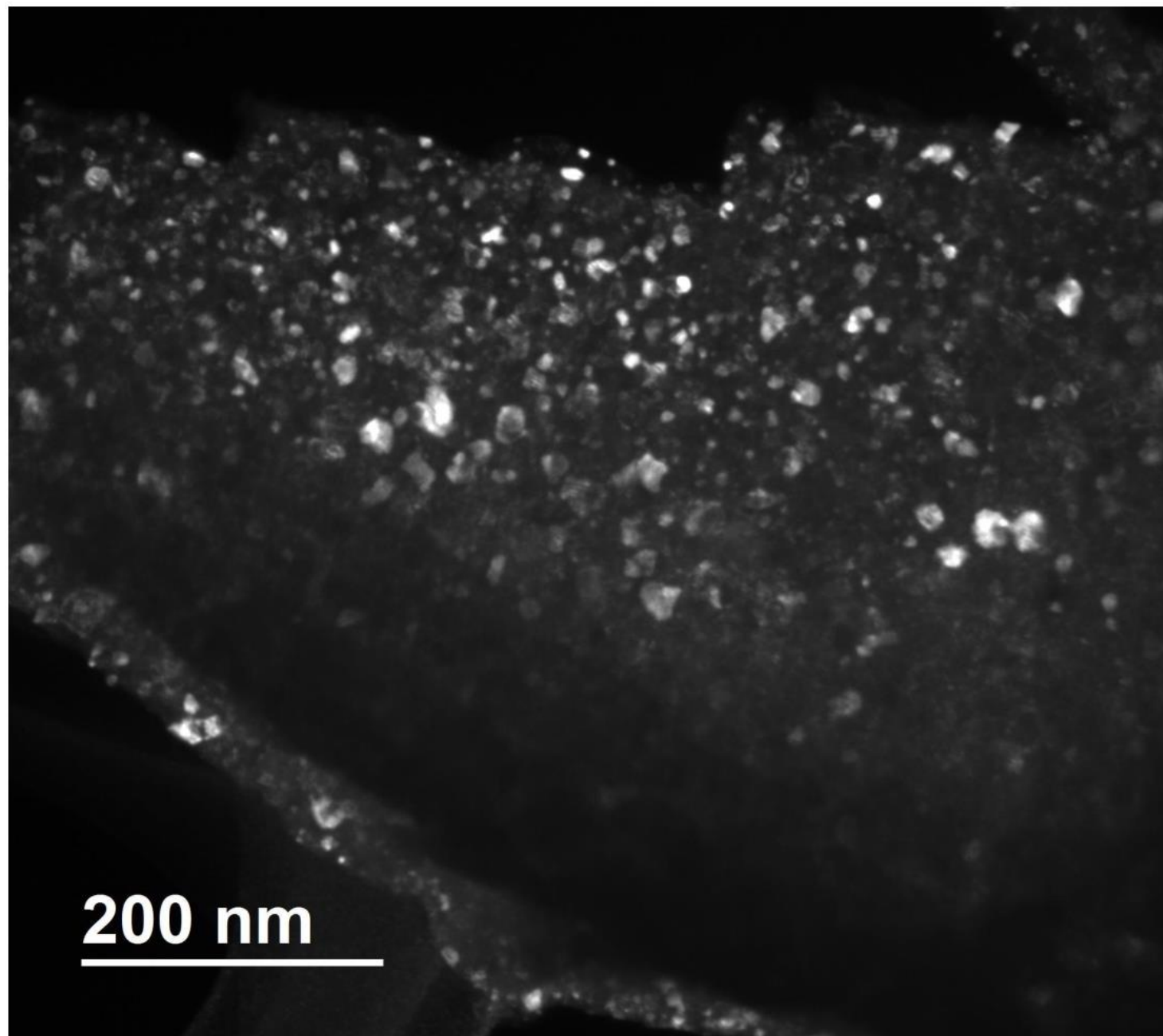


Figure S6. Dark field TEM image of yttrium oxycarbonate.



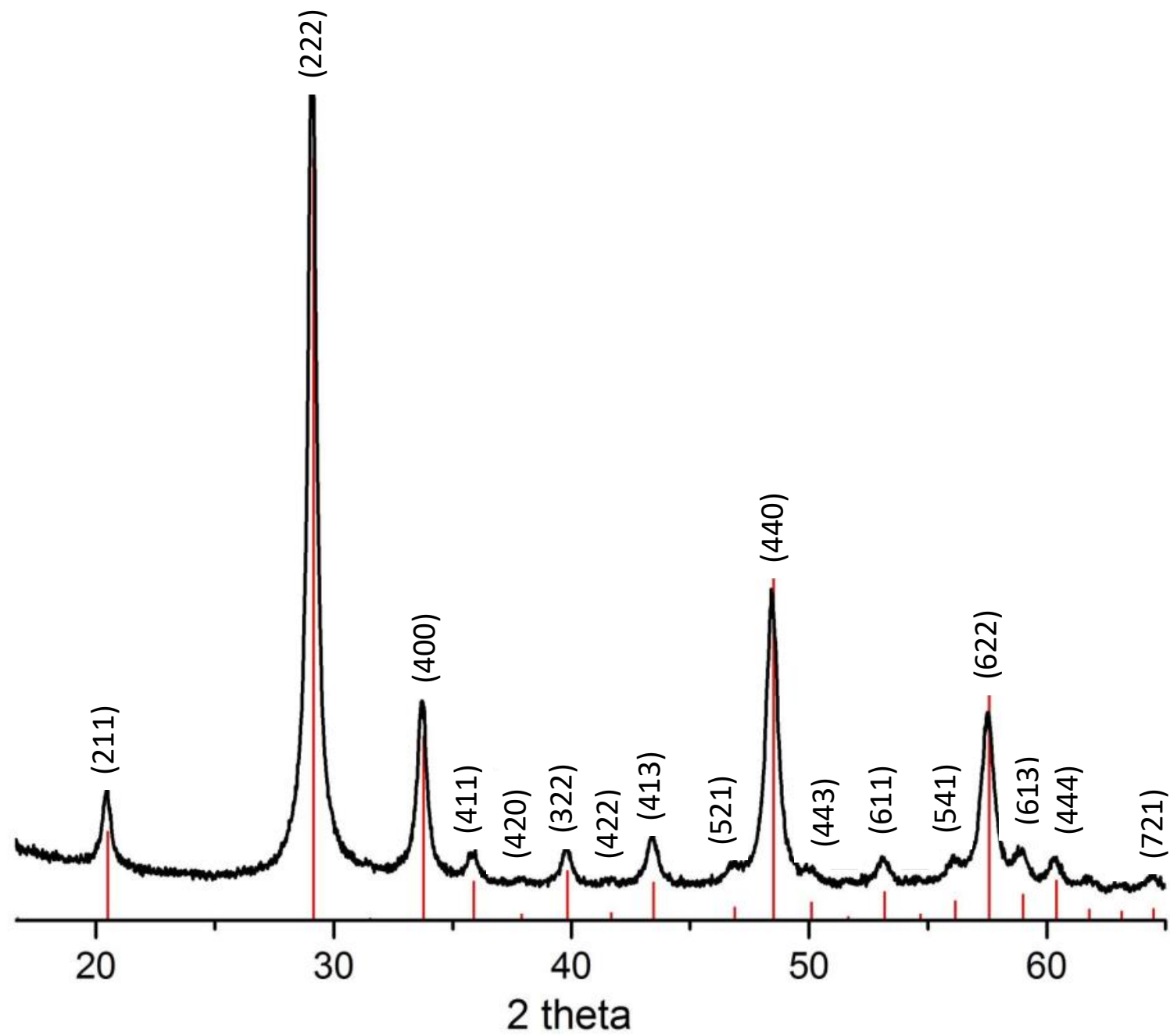


Figure S7. XRD pattern of  $\text{Y}_2\text{O}_3$ .

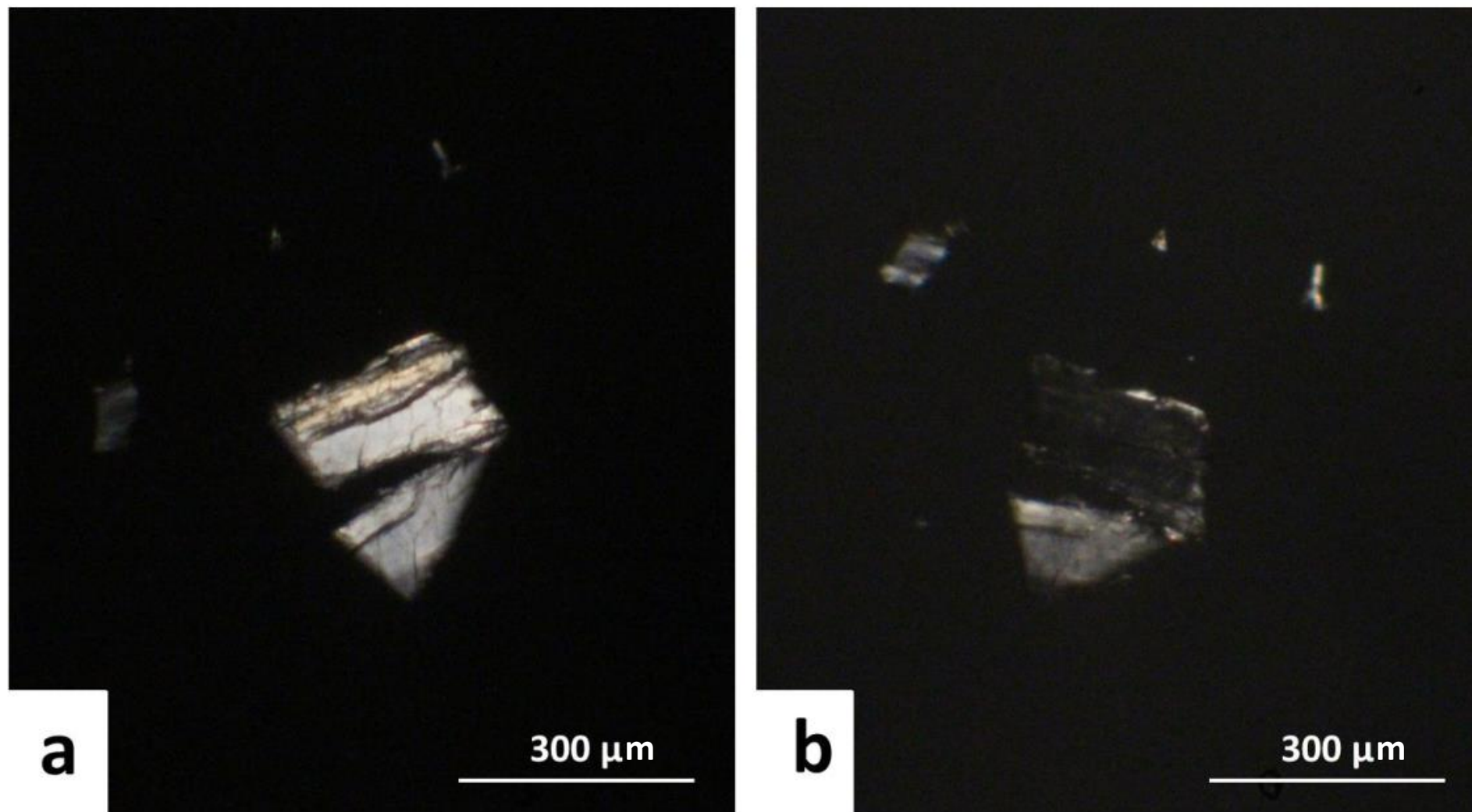


Figure S8. Optical micrographs of yttrium oxide pseudomorph at rotation in crossed nicols.



Table S1. Calculated values of weight loss at different stages of thermal decomposition.

Reaction product	Molar mass, g/mol	$\Delta m, \%$ (from $Y_2(C_2O_4)_3 \cdot 6H_2O$ )
$Y_2(C_2O_4)_3 \cdot 6H_2O$	550	0
$Y_2(C_2O_4)_3 \cdot 3,5H_2O$	505	-8,2
$Y_2(C_2O_4)_3 \cdot 2H_2O$	478	-13,1
$(YO)_2CO_3$	270	-50,9
$Y_2O_3$	226	-58,9