

Supporting information:

Kinetics of the hydrothermal synthesis of nanosized $K_xNa_{1-x}NbO_3$

Susanne Linn Skjærvø^a, Kristin Høydalsvik Wells^a, Wouter van Beek^b, Tor Grande^a and Mari-Ann Einarsrud^{a,}*

- a. FACET Functional Materials and Materials Chemistry, Department of Materials Science and Engineering, Norwegian University of Science and Technology, 7491 Trondheim, Norway
- b. Swiss-Norwegian Beamlines at the European Synchrotron Radiation Facility, 71 Avenue des Martyrs, CS 40220, 38043 Grenoble Cedex 9, France

Key words: *in situ* X-ray diffraction, time-resolved, synchrotron, nucleation and growth, hydrothermal, solvothermal

*Corresponding author:

Mari-Ann Einarsrud

mari-ann.einarsrud@ntnu.no

phone: +47 48136521

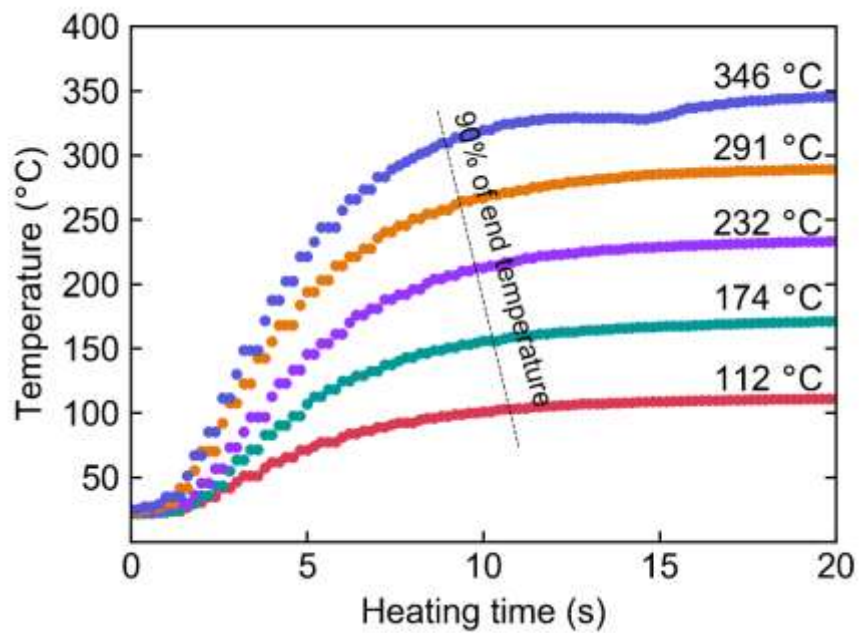
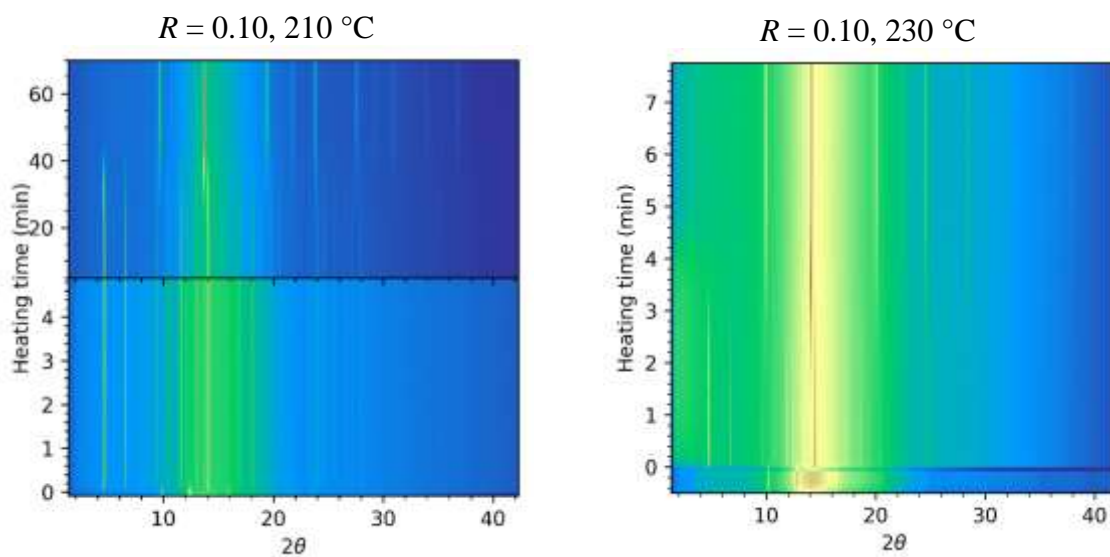
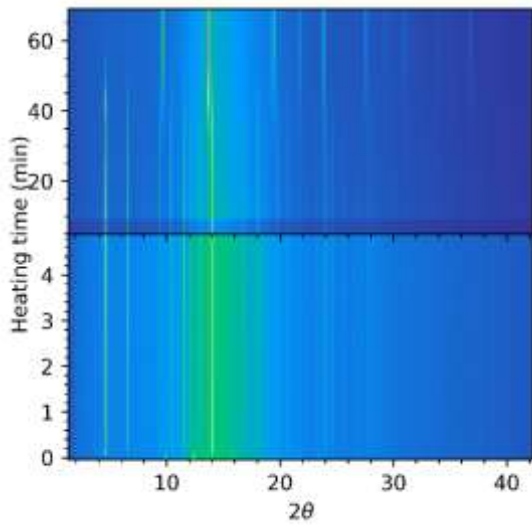


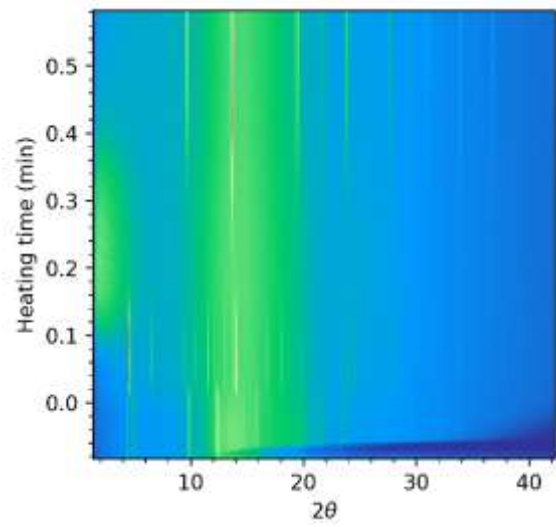
Figure S1 Temperature profiles for different end temperatures, measured with a thermocouple inside a capillary filled with pure water and pressurized to 100 bar. The temperatures on top of each plot gives the end temperature for each measurement.



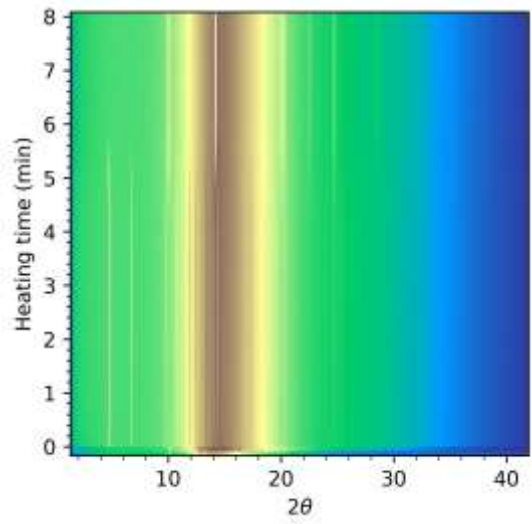
$R = 0.15, 210\text{ }^{\circ}\text{C}$



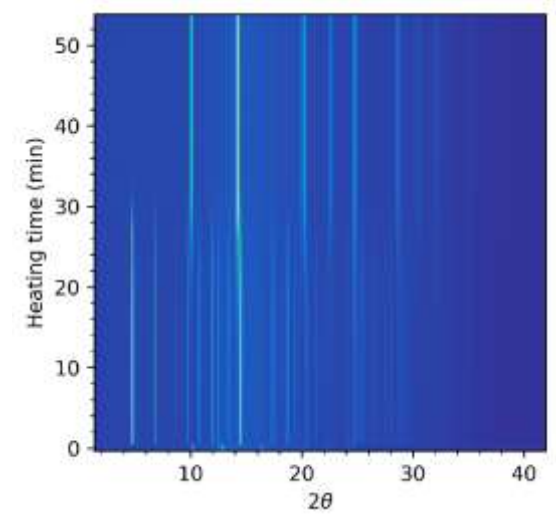
$R = 0.15, 290\text{ }^{\circ}\text{C}$



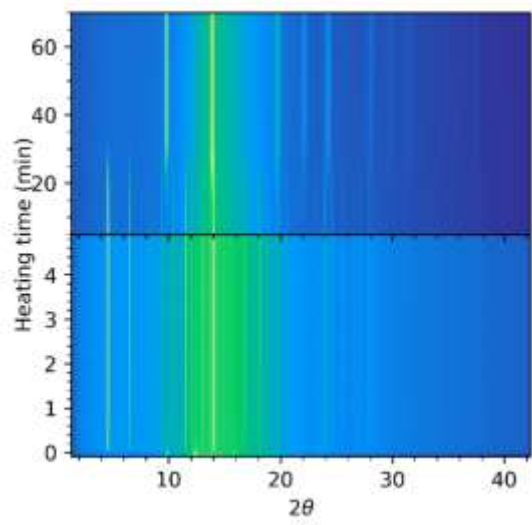
$R = 0.25, 230\text{ }^{\circ}\text{C}$



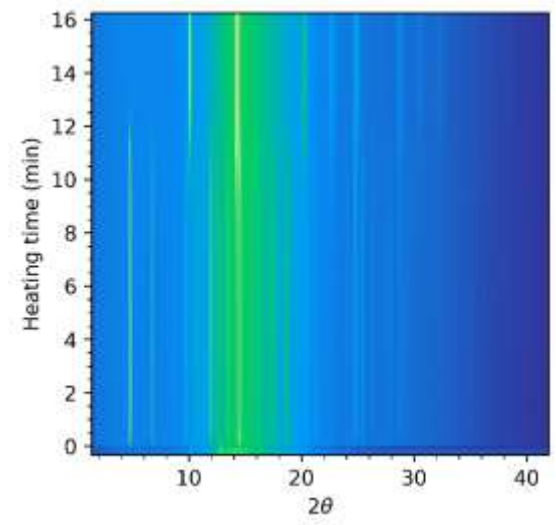
$R = 0.25, 230\text{ }^{\circ}\text{C}$



$R = 0.30, 210\text{ }^{\circ}\text{C}$



$R = 0.30, 230\text{ }^{\circ}\text{C}$



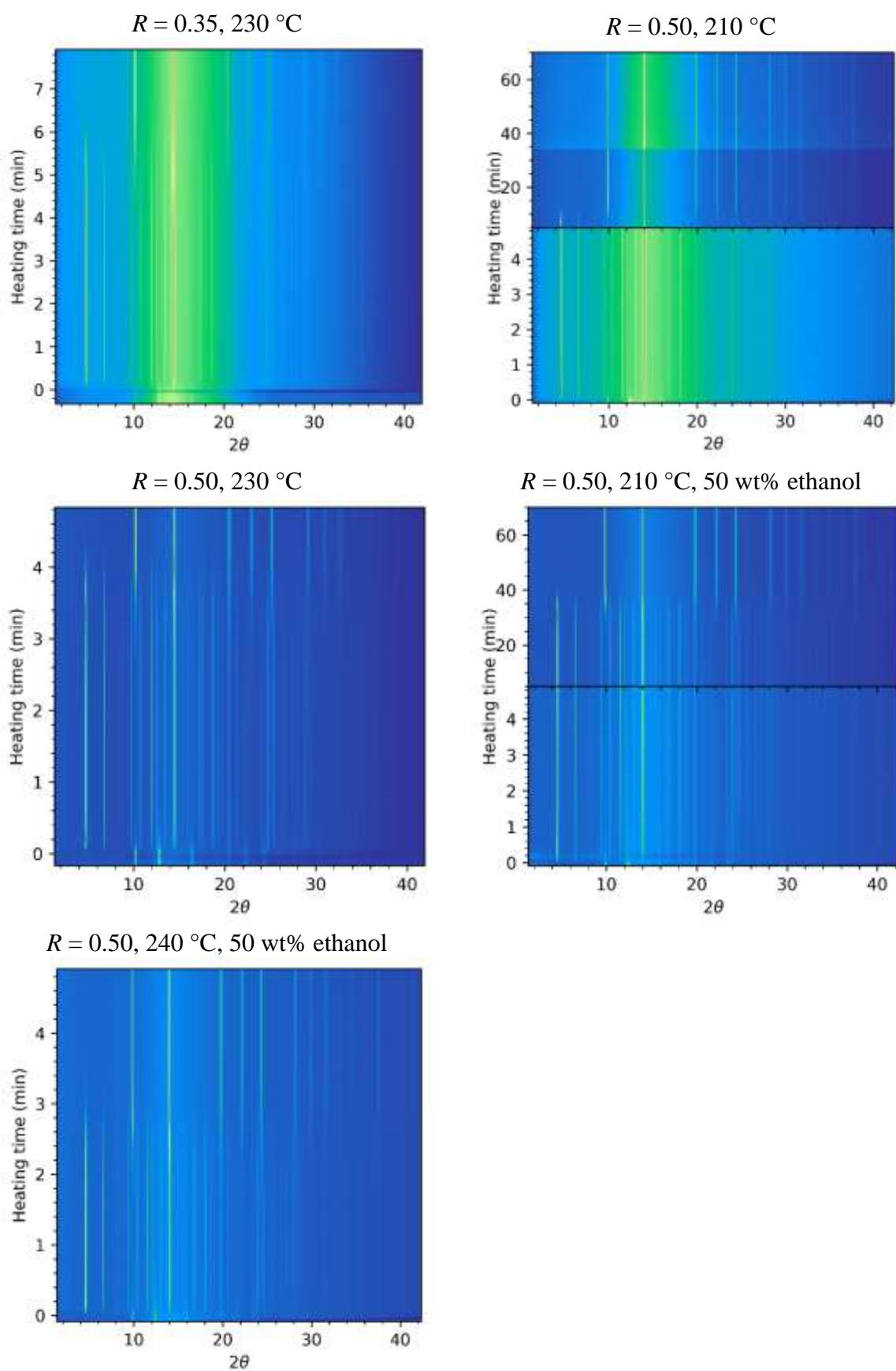


Figure S2 Contour plots showing the phase evolution during hydrothermal synthesis of $K_xNa_{1-x}NbO_3$ at various temperatures and R -values. The two experiments with 50/50 wt% water and ethanol are indicated.

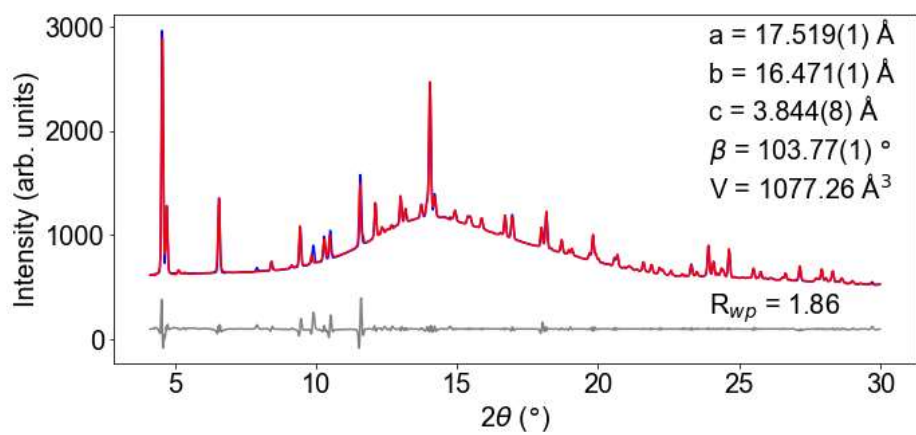
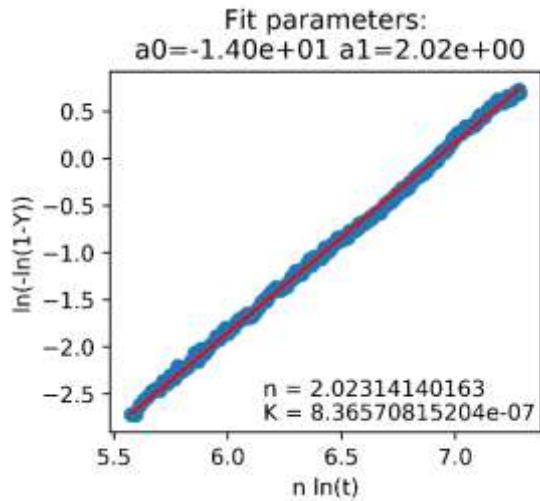
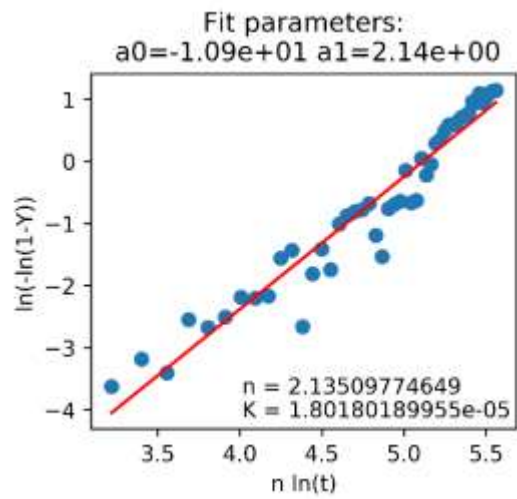


Figure S3 Visualization of Pawley fit of the intermediate phase produced at 210 °C for $R = 0.5$. The wavelength is 0.6776 Å.

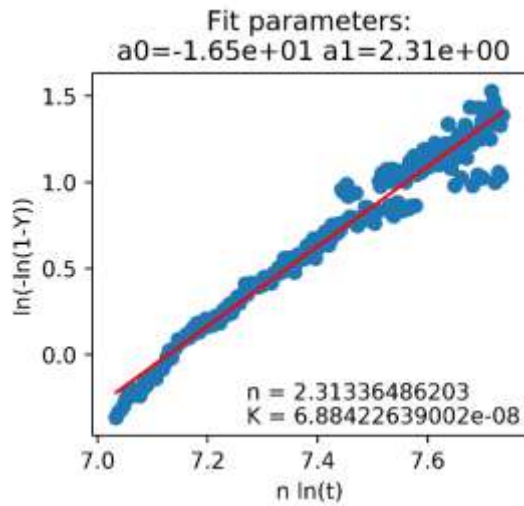
$R = 0.10, 210\text{ }^{\circ}\text{C}$



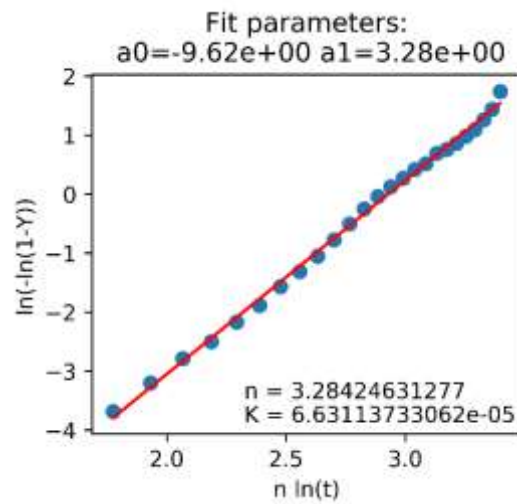
$R = 0.10, 230\text{ }^{\circ}\text{C}$



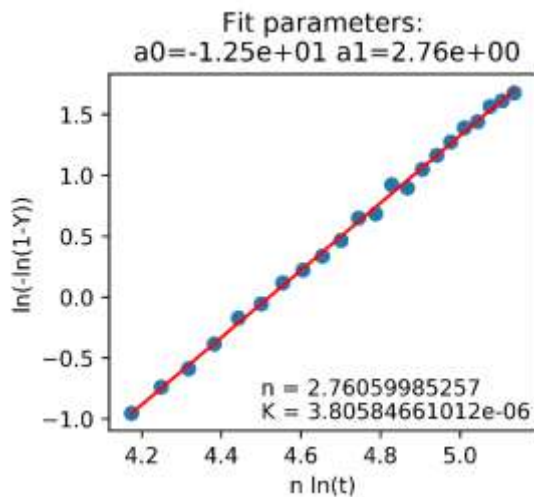
$R = 0.15, 210\text{ }^{\circ}\text{C}$



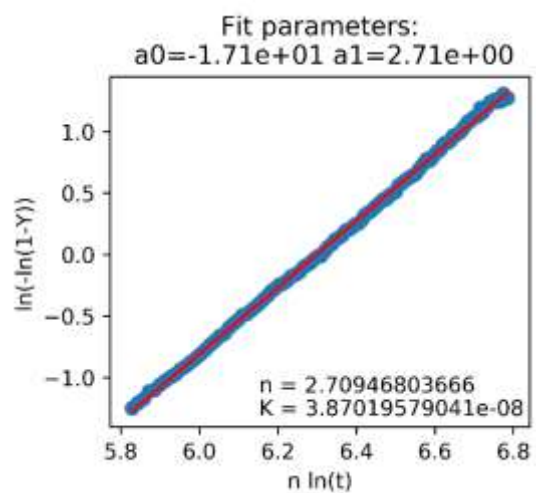
$R = 0.15, 290\text{ }^{\circ}\text{C}$



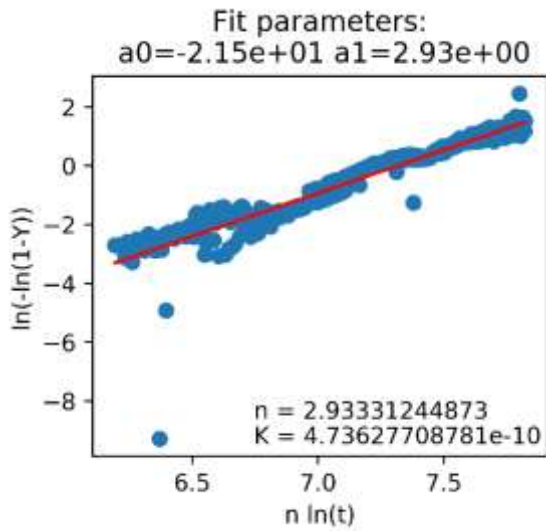
$R = 0.25, 230\text{ }^{\circ}\text{C}$



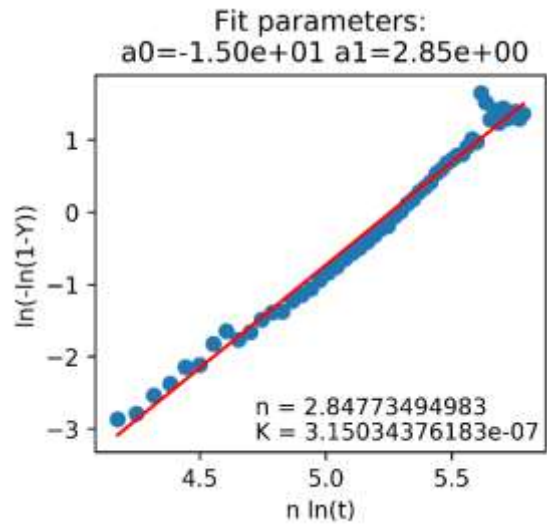
$R = 0.25, 230\text{ }^{\circ}\text{C}$



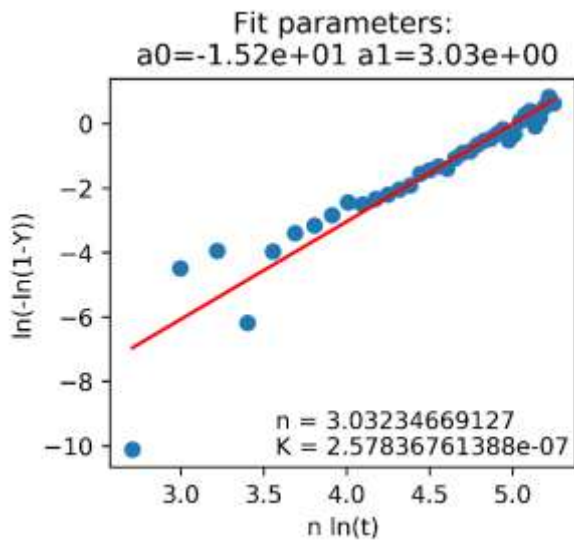
$R = 0.30, 210\text{ }^{\circ}\text{C}$



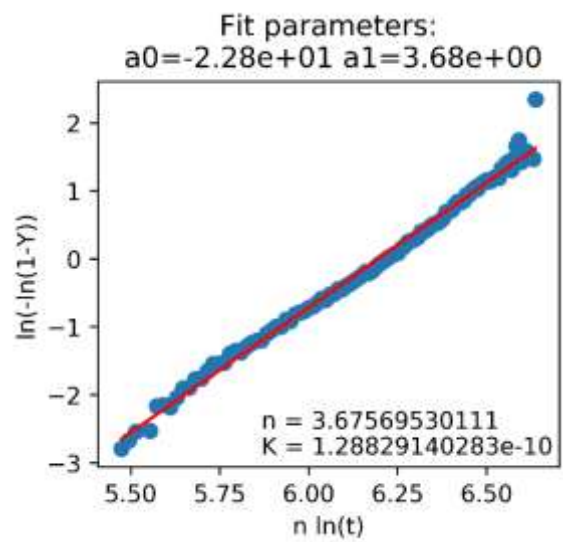
$R = 0.30, 230\text{ }^{\circ}\text{C}$



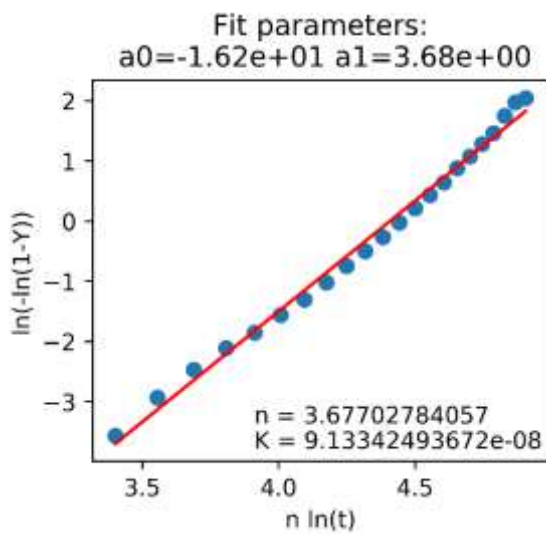
$R = 0.35, 230\text{ }^{\circ}\text{C}$



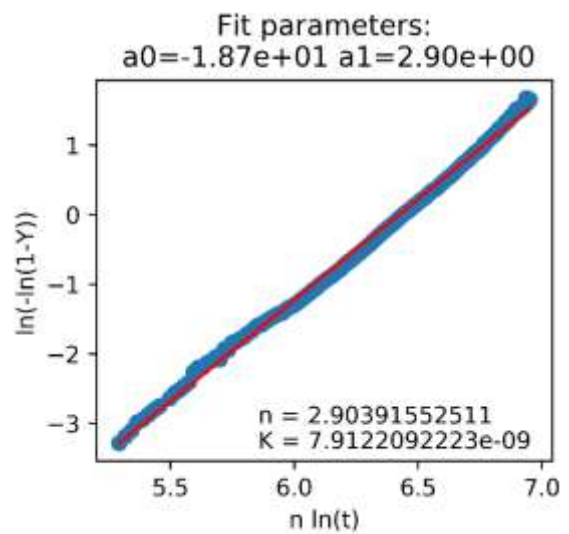
$R = 0.50, 210\text{ }^{\circ}\text{C}$



$R = 0.50, 230\text{ }^{\circ}\text{C}$



$R = 0.50, 210\text{ }^{\circ}\text{C}, 50\text{ wt\% ethanol}$



$R = 0.50$, 240 °C, 50 wt% ethanol

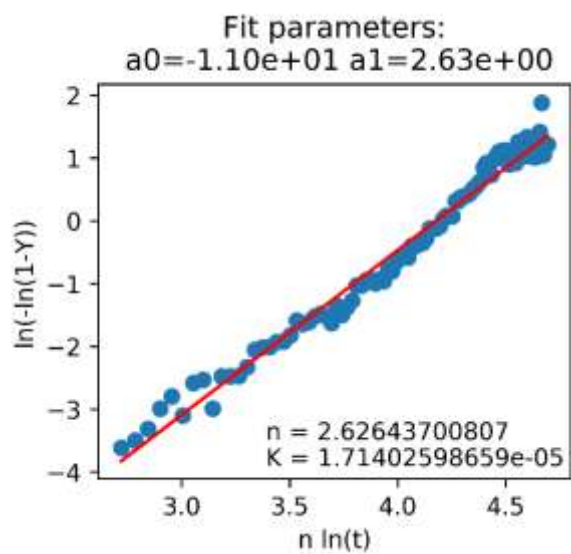


Figure S4 Sharp-Hancock plots showing the growth of $K_xNa_{1-x}NbO_3$ during hydrothermal synthesis at various temperatures and R -values. The two experiments with 50/50 wt% water and ethanol are indicated.