

RECRYSTALLIZATION OF TWIN-ROLL CAST AA8079 ALUMINUM ALLOY AFTER HOMOGENIZATION

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INTRODUCTION

The standard JMAK model of recrystallization describes recrystallization kinetics via a parameter n . Theoretical value of n for recrystallization of a single phase material with no defects in 3 dimensions is 4. However, real materials contain a number of defects including primary phase particles, solute atoms and material surface. All these defects retard grain boundary motion during recrystallization, which results in a lower kinetics parameter n . Recrystallization of a commonly used foil stock aluminum alloy AA8079 was studied. The material was homogenized at two temperatures – 420 °C and 580 °C, forming diverse particle structures. The material was then rolled to 600 μm and isothermal annealing was performed at 250 °C, 275 °C and 300 °C.

MATERIAL

Twin roll cast 8079 alloy			
Alloying element concentration in wt.%			
Al	Fe	Si	Mn
Bal.	1.06	0.06	<0.01

METHODS

Isothermal heating

- 250 °C, 275 °C and 300 °C
- Semilogarithmic time interval from 10 min up to 960 min

Recrystallized fraction evaluation

- Based on microhardness measurements
- Qness Q10 measuring device
- Simplified model:

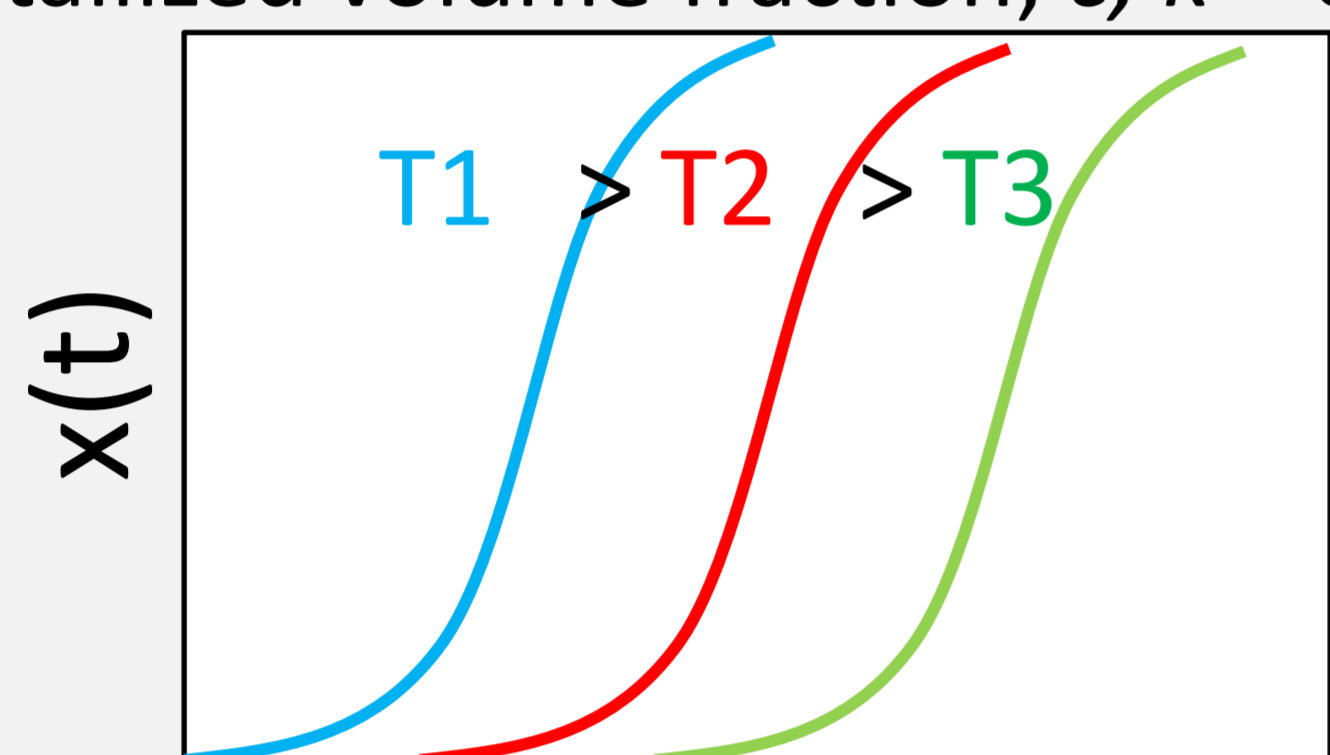
$$x(t) = \frac{HV_0 - HV(t)}{HV_0 - HV_R}$$

- HV_0 , $HV(t)$, HV_R – microhardness before recrystallization, at time t and after recrystallization respectively

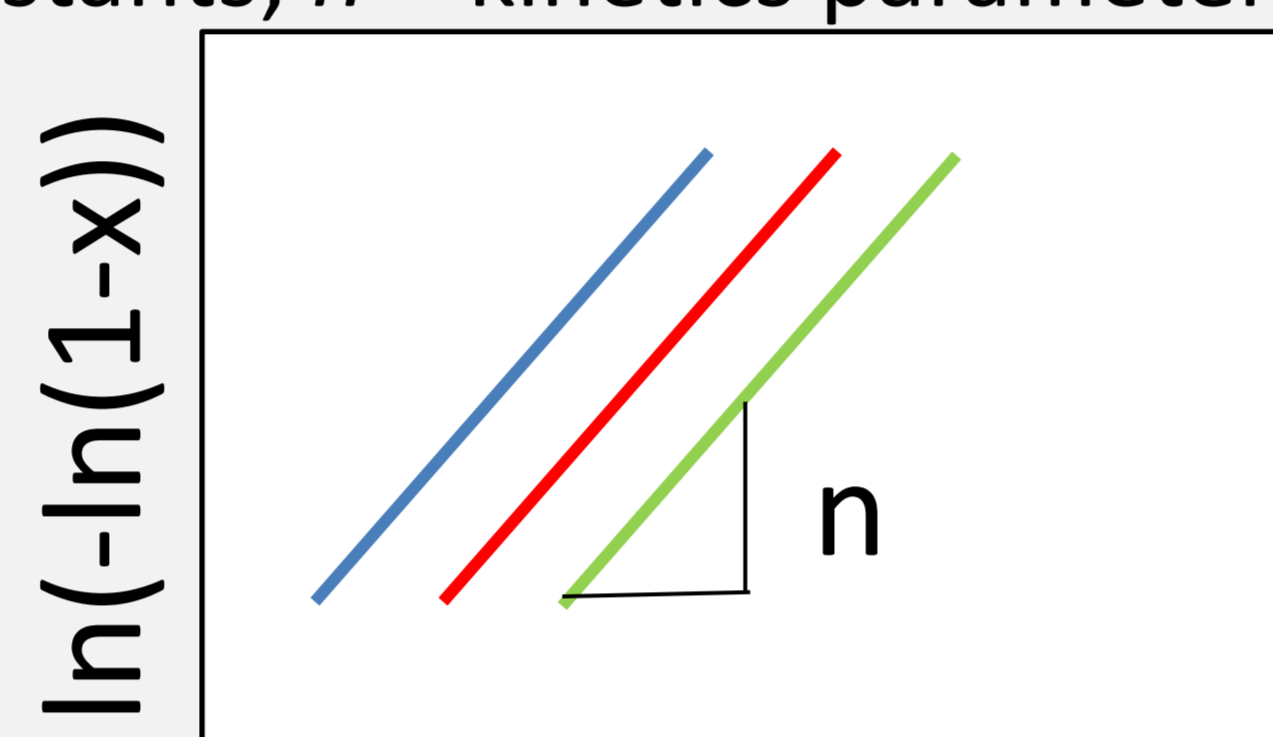
THE JMAK MODEL

$$x(t) = C \exp(-kt^n)$$

$x(t)$ – recrystallized volume fraction; c , k – constants; n – kinetics parameter



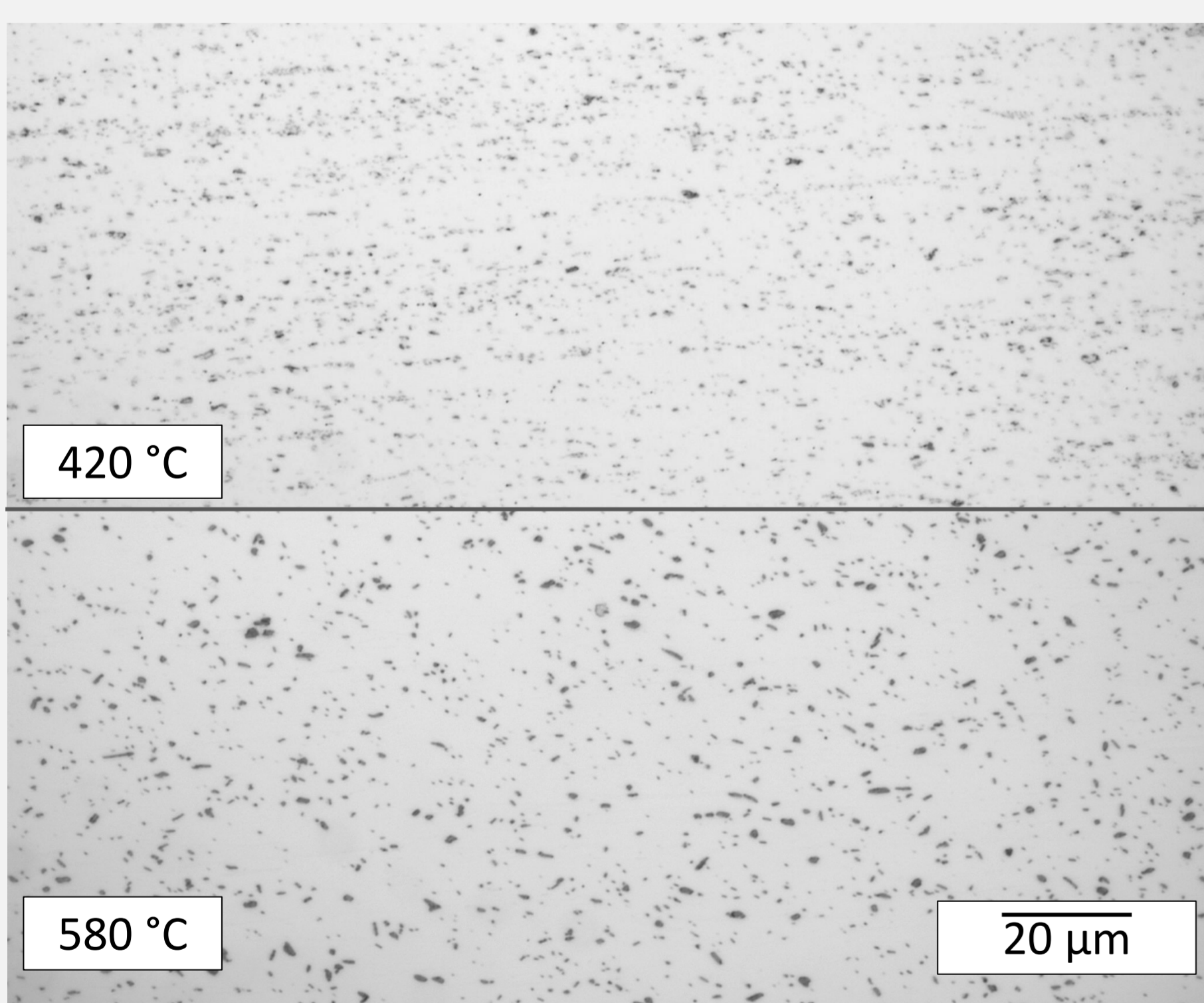
log(t)
Time dependent
recrystallized volume fraction



log(t)
JMAK plot with n parameter
evaluation

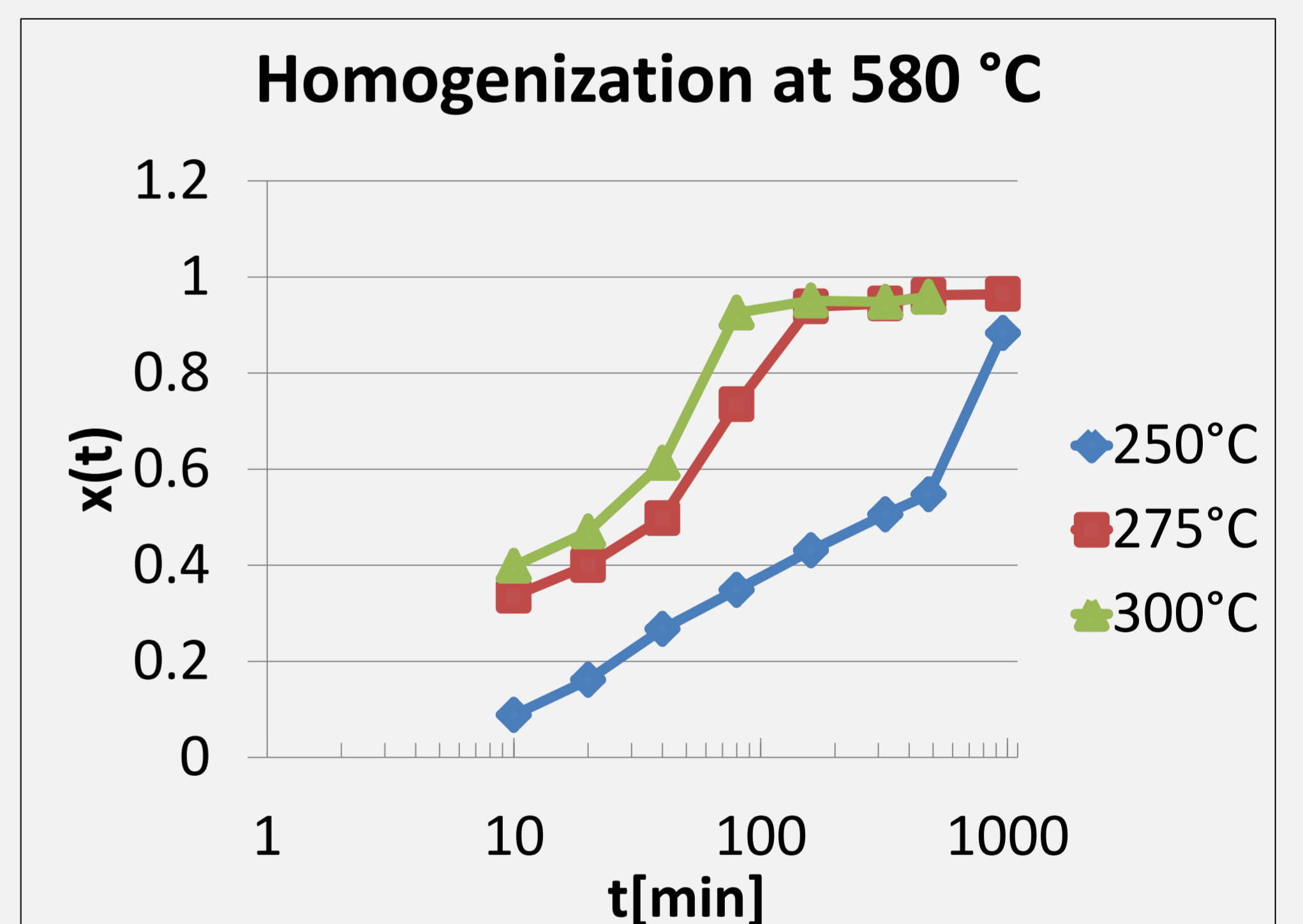
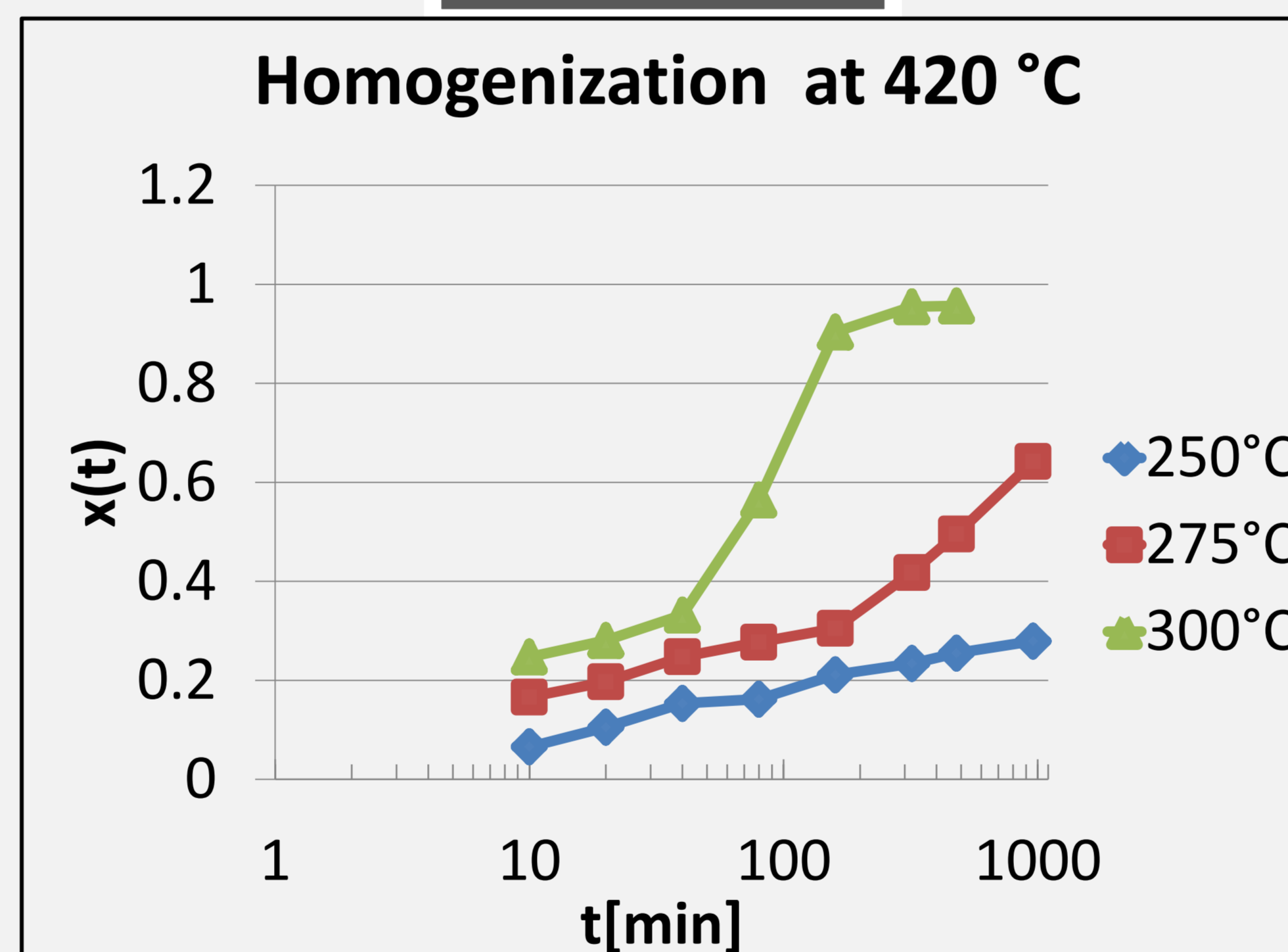
RESULTS

- Parameter n was evaluated where possible
- n can only be evaluated in the linear part of the JMAK plot

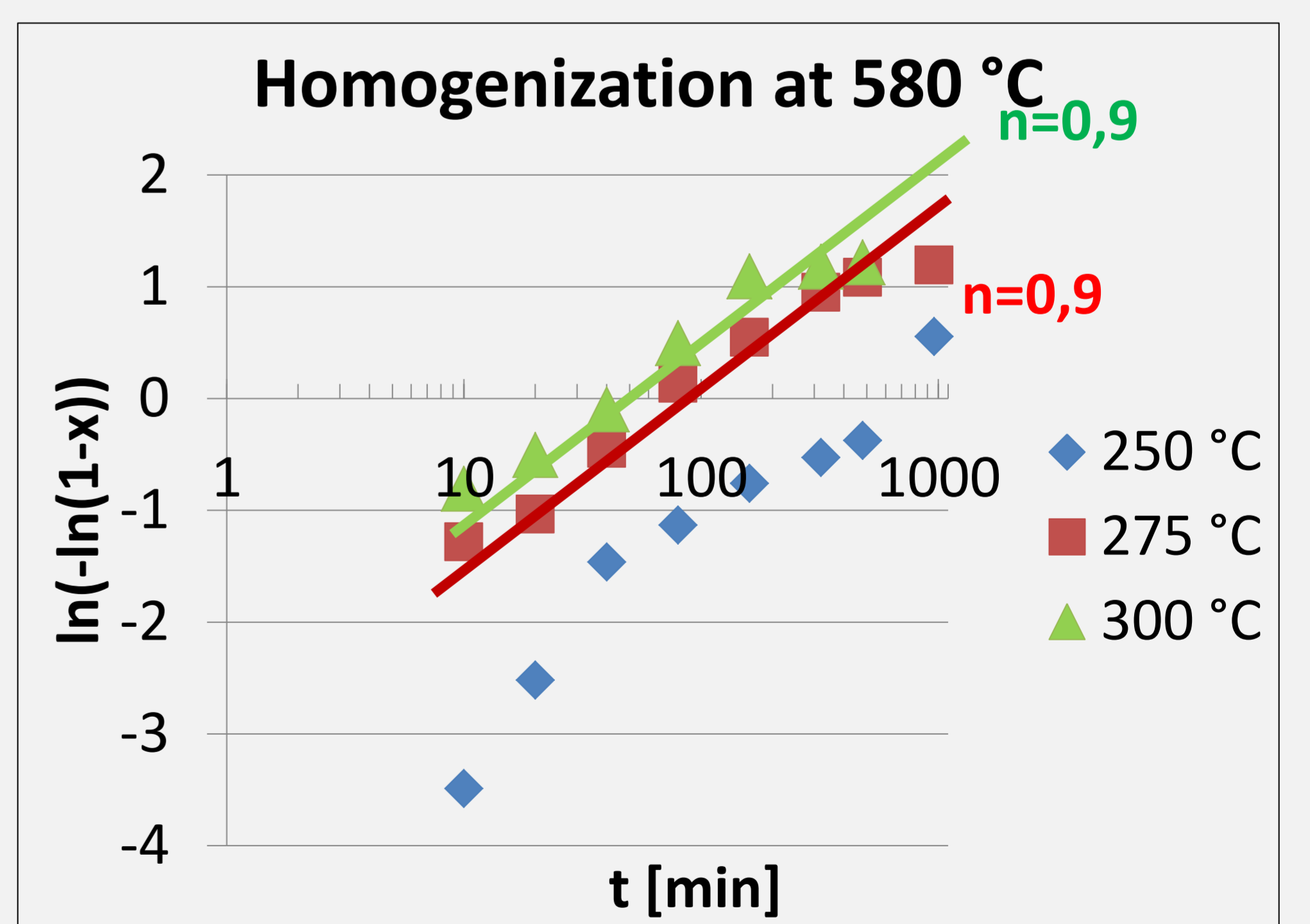
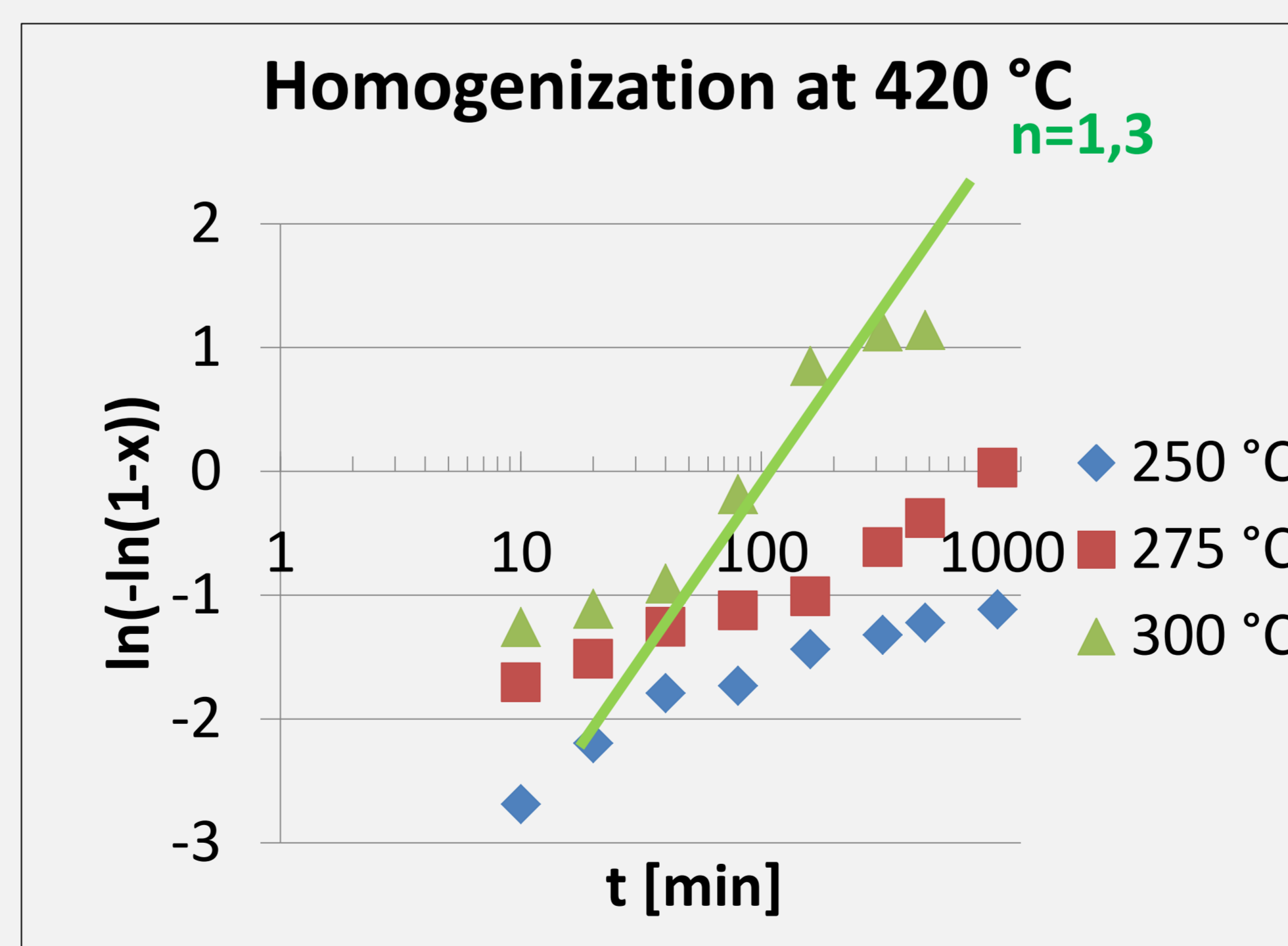


Distribution of particles after
homogenization

Recrystallized fraction



JMAK plot



SUMMARY

- No recrystallization occurs at 250 °C independently on homogenization treatment
- Recrystallization is effectively hindered in specimens homogenization treated at 420 °C due to a significant influence of Zener drag
- Recrystallization is promoted in specimens homogenization treated at 580 °C due to particle stimulated nucleation

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