Simulation of Cu-precipitates in Martensitic PH stainless steels

PhD student: Ze Sheng
Duration: 4 years
Funding: CSC scholarship
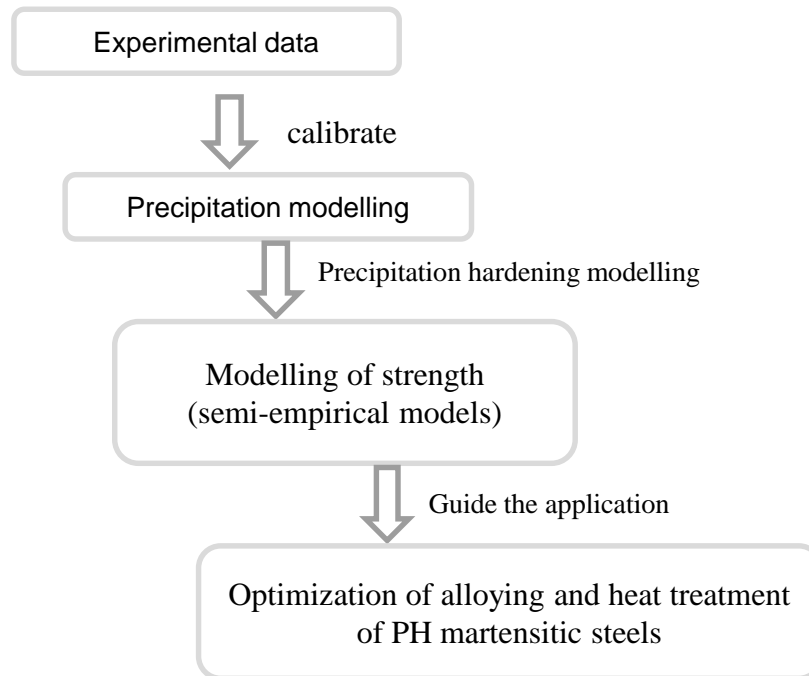Advisor: Peter Hedstöm, Joakim Odqvist

Research Scope:
- Interpret the main factors which affects Cu-rich precipitate formation
- Fit the experimental data with simulation results in good resemblances (phase fraction, number density and mean radius)
- Predict the precipitation hardening in a new material with certain parameters (aging temperature, composition, etc)
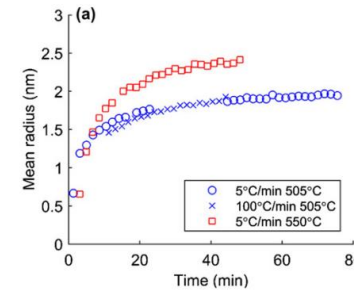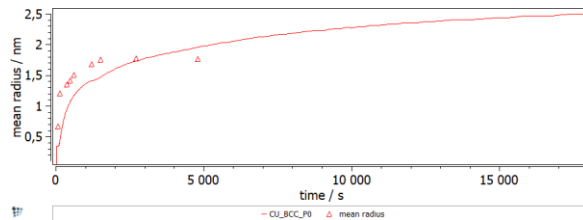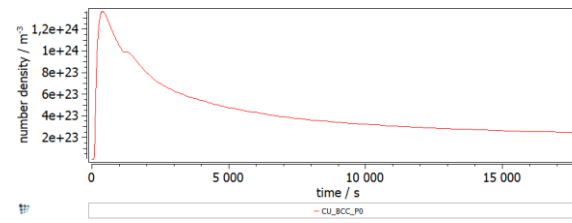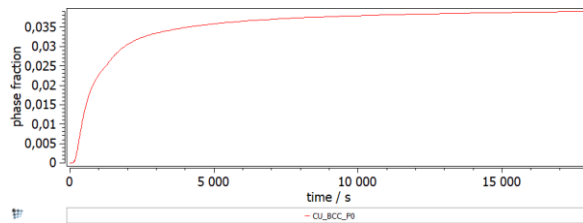
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Outline

Experimental data

⬇ calibrate

Precipitation modelling

⬇ Precipitation hardening modelling

Modelling of strength
(semi-empirical models)

⬇ Guide the application
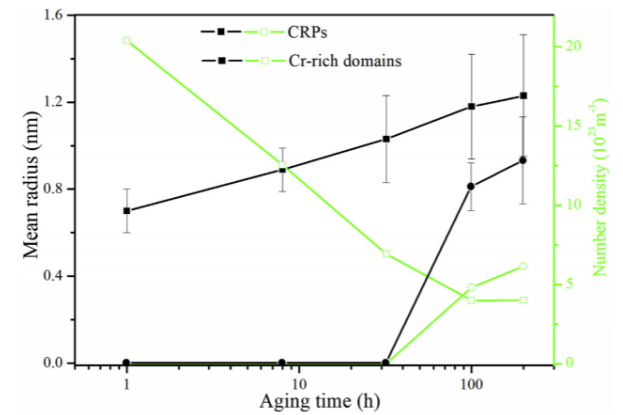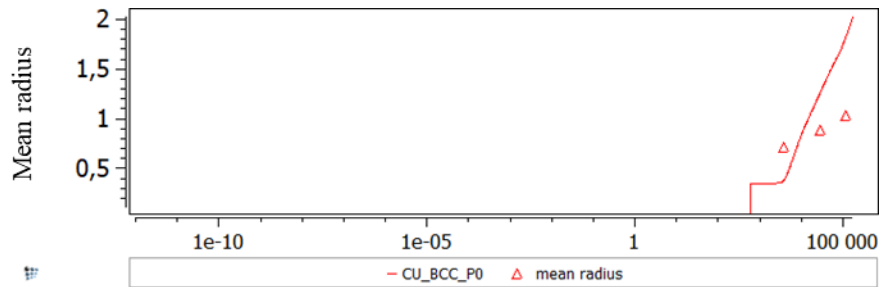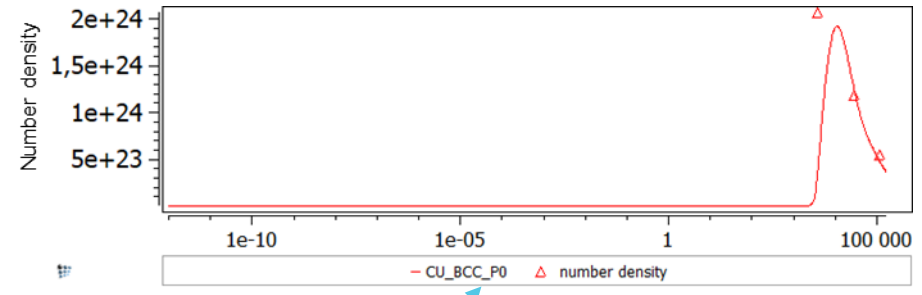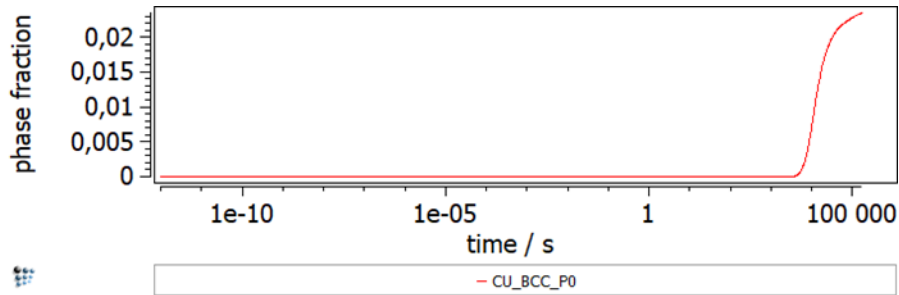
Optimization of alloying and heat treatment
of PH martensitic steels

Prep parameter triplets of Cu precipitates

Table 1
Chemical composition of the 15-5PH alloy (at%).

	Cr	Ni	Cu	Mn	Si	Mo	Nb	C	P	S	Fe
Min	14.9	3.3	2.2	0	0	0	0	0	0	0	Bal.
Max	16.5	5.2	3.9	1	2	0.3	0.27	0.32	0.05	0.026	Bal.

L. Couturier et al. / Materials and Design 107 (2016) 416–425

Z. Wang et al. / Acta Materialia 156 (2018) 158-171