COST 526

"Automatic Process Optimization in Materials Technology"

(APOMAT)

Half-Yearly Report

To be sent to **V.Tesch@access.rwth-aachen.de** until **October 15, 2005**

1. Reporting Period	**1 January 2005 – 30 June 2005**
Project title	**Optimization of heat treatment of magnetic materials applying the thermomagnetic curves data**
Project leader Organization	Dr. Tomáš Žák Institute of Physics of Materials, AS CR, Žižkova 22, CZ-61662 Brno
Main collaborators involved	Lukasz Rauch Faculty of Metallurgy and Material Science Department of Computer Methods in Metallurgy University of Science and Technology, Krakow

2. Funding Situation	
Amount of money received specifically for COST	**3** kEuros
Other resources partially used for the project	**1** kEuros

3. International Collaboration (mention group and type of work done in collaboration during the reporting period)
Participation in the Working Group Meeting in Brno + project progress report ν YES π NO

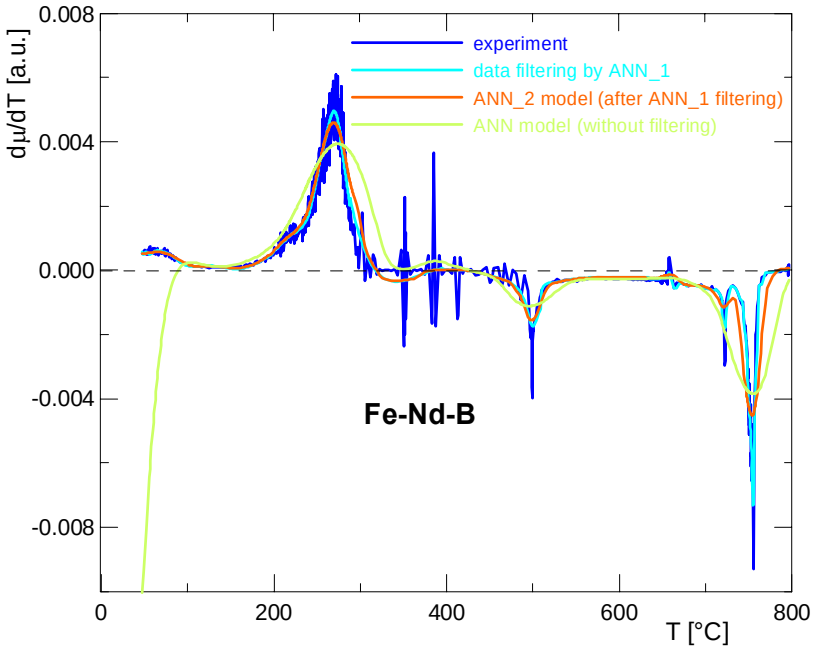
4. Industry participation (mention name of companies and work done in collaboration during the whole project)
No

5. Meetings, visits, exchange of scientists, short-term scientific missions	**Location, date**

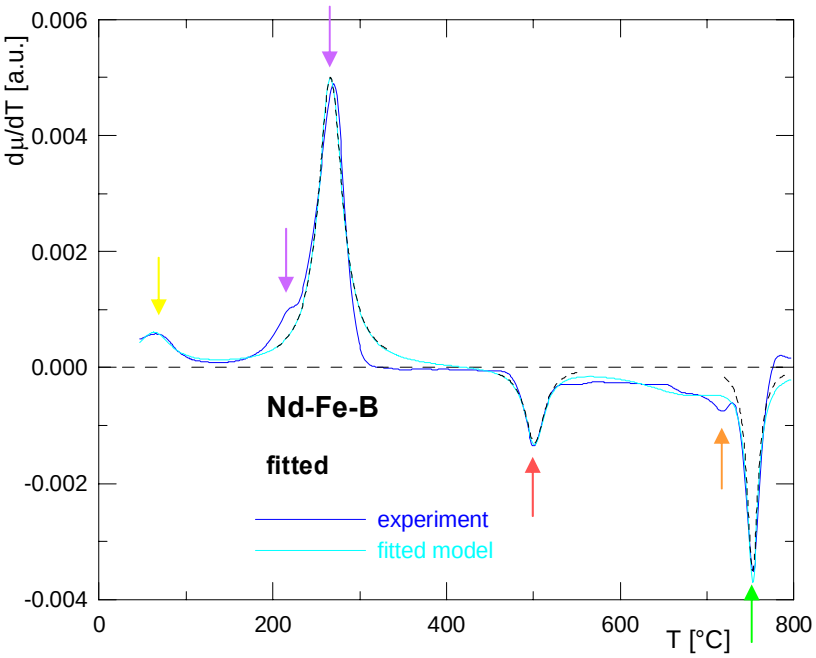
6. Progress within the reporting period

(Not exceeding 3 pages, including tables and figures)

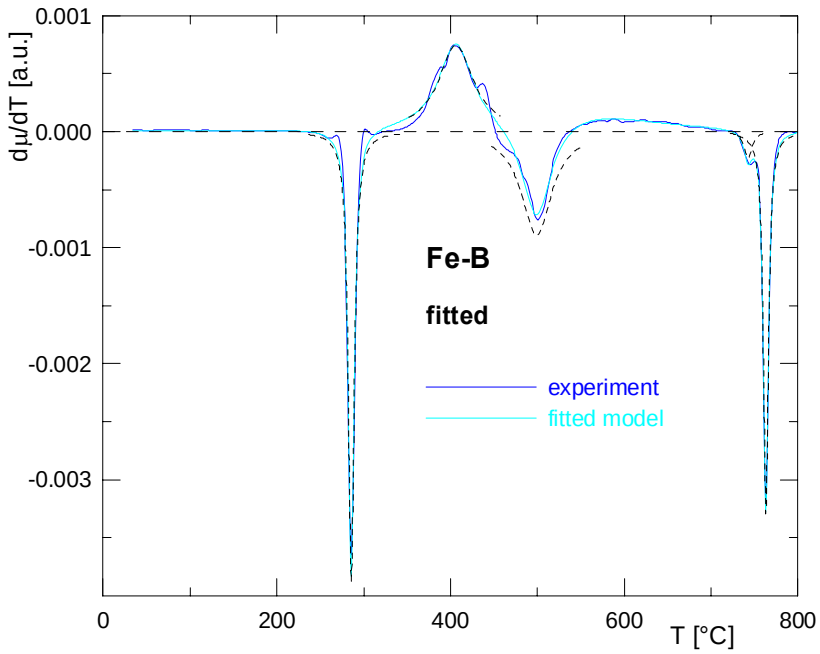
Thermomagnetic curve derivative. It is an apparently smooth curve but with problematic derivative. At the nonparametric modelling of the thermomagnetic curve (without filtering) the preliminary filtering is necessary, as the noise disturbs the model. Only basic shape of the curve has been retained.



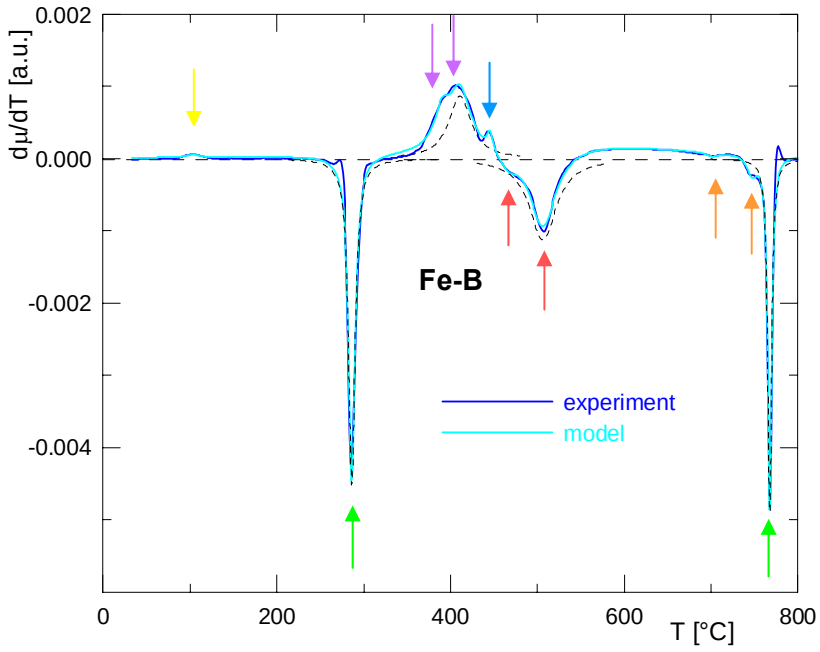
To avoid a human interaction and to be as near as possible to the nonparametric modeling, an algorithm was programmed for estimation of preliminary line positions. This algorithm is based on the tracing of the derivative curve behavior. It is able to distinguish between critical temperature peeks and artifacts partially.



Still, the least squares fitting gives us satisfactory results what about the most important points on the temperature scale.



The enhancement of the lines estimation algorithm using higher derivatives of thermomagnetic curve allowed us to complete the process of automatic estimation of critical temperatures that are most important for the heat treatment of amorphous magnetic materials.



Results of such automated estimation of lines position followed by the fitting process are almost comparable with careful “handwork”. Critical temperatures are visible also of subtle kind of processes and they can be distinguished, similarly as various linewidths.

7. List of publications

a) Published

Tomáš Žák, Oldřich Schneeweiss, Dragica Minić: Structure and phase analysis of electrochemically synthesized Fe–W, J. Magn. Magn. Mater. 272–276 (2004) e1119–e1121.

Rauch Ł., Talar J., Žák T., Kusiak J.: Filtering of thermomagnetic data curve using artificial neural network and wavelet analysis. In proceedings of the International Conference on Artificial Intelligence and Soft Computing 2004, Lecture Notes in Artificial Intelligence, Vol. 3070, 2004, 1093-1098.

b) Submitted for publications

c) In preparation

Tomáš Žák, Yvonna Jirásková: Confit: mössbauer fitting program