COST 526

"Automatic Process Optimization in Materials Technology"

(APOMAT)

Half-Yearly Report

1. Reporting Period	**1.7.2002 – 31.12.2002**
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	Faculty of Natural Sciences and Engineering, University of Ljubljana

2. Funding Situation	
Amount of money received specifically for COST	**10** 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 Budapest + project progress report

❒ NO

X **YES**

D.M. Minić, Faculty of Physical Chemistry, University of Belgrade, Yugoslavia
Collaboration on an FeW material, thermomagnetic curves measurement

4. Industry participation

(mention name of companies and work done in collaboration during the whole project)

No

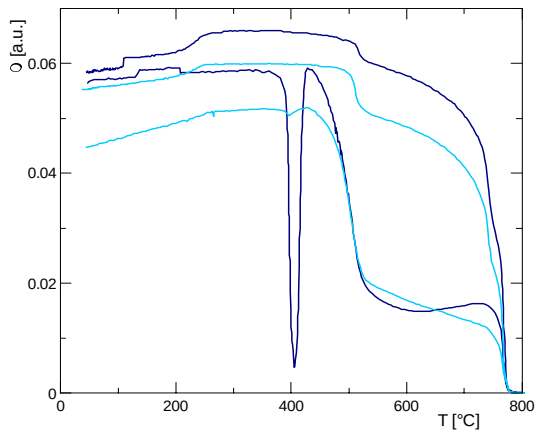
5. Meetings, visits, exchange of scientists, short-term scientific missions	**Location, date**
Magnetic Measurement 2002	**Bratislava, Slovak Republic** **September 11 - 13**

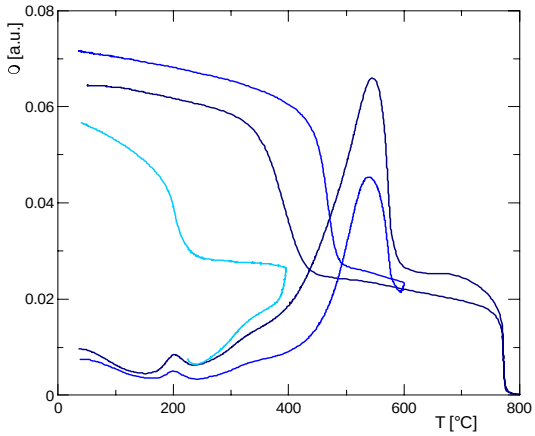
6. Progress within the reporting period

(Not exceeding 3 pages, including tables and figures)

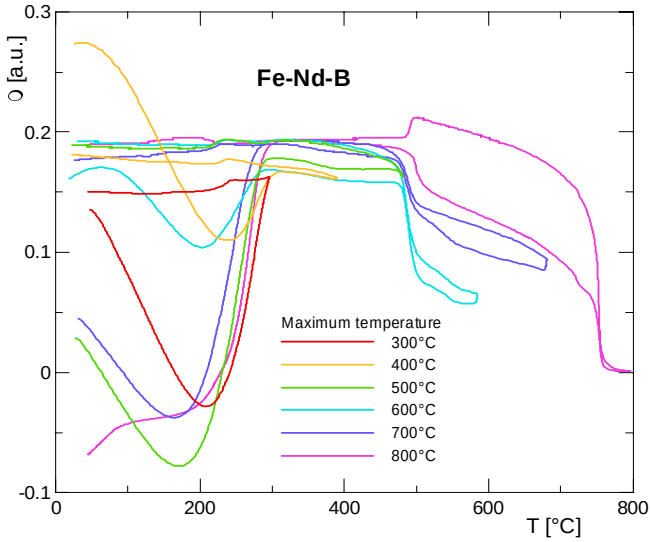
In the elapsed period, the funding situation was solved finally and just before the end of the period the above-mentioned amount of money was received. Thus at least some opening work could be done.

Just to remind the aim of the project we want to show you thermomagnetic curves of some interesting materials.

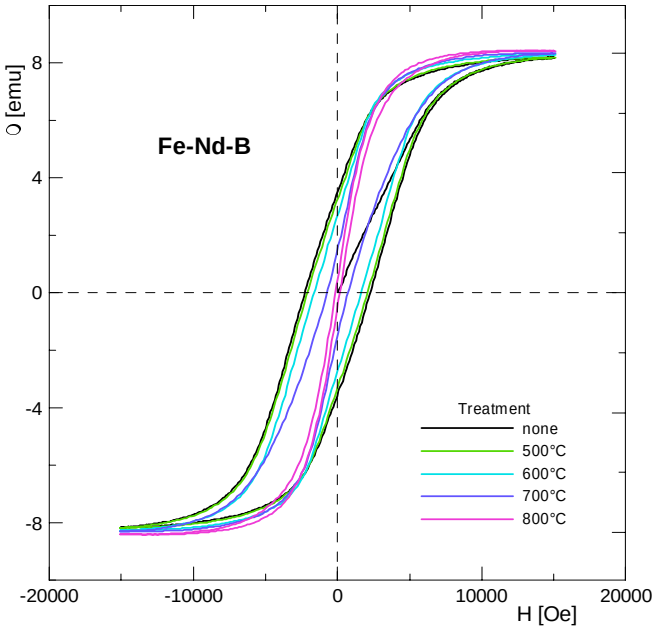




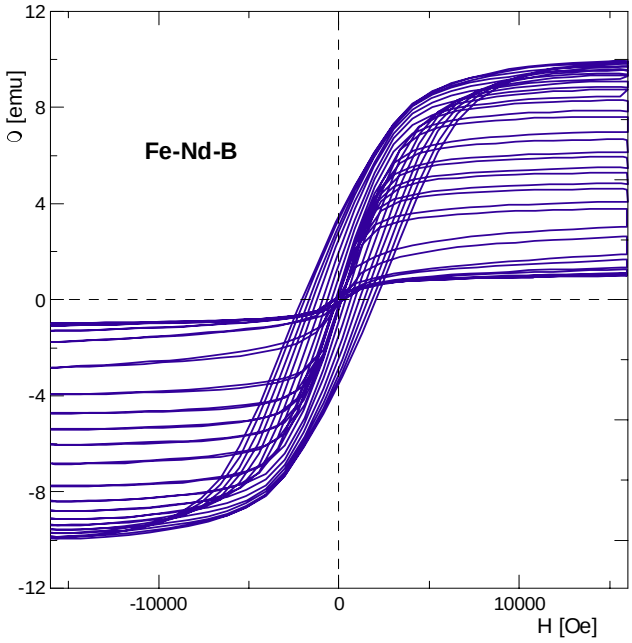
The goal is to suggest the possible heat treatment to optimize the magnetic properties.
We tried to specify which process of measurement and subsequent treatment of thermomagnetic curves will be for the final purpose the most suitable.



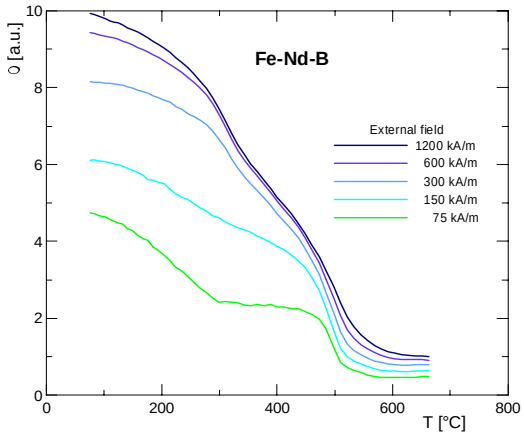
In the above figure the subsequent themomagnetic curves with increasing limit temperature are recorded. Such a measurement is rich on information and illustrative, but time consuming. Between each two themomagnetic curves hysteresis loops can be taken (see next figure). Changes in the material quality can be clearly seen.

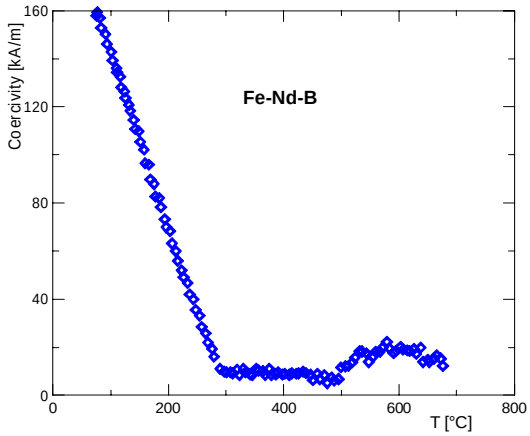


The whole set of various dependences can be gained from the measurement with combination of triangular function of external field (as for hysteresis loops) with a permanently increasing temperature as for thermomagnetic curves. This bundle of hysteresis loops is in next figure.



In this case, it is not necessary to make any preliminary study of the material. The measurement process itself if relatively easy. Several basic magnetic characteristics can be gained using a mathematical treatment of the digital record of the measurement. A thorough interpretation is necessary. Examples of extracted magnetic characteristics are in the next two figures: thermomagnetic behaviour (left) and temperature dependence of coercivity (rigt).





As most promising the simple measurement of thermomagetic curve followed by computation of its derivative was revealed (see the figure below). Here the all critical temperatures can be seen and distinguished. It will allow us to start with mathematical decomposition or fitting of such kind of curves to digitalize them and find critical temperature values to set up the optimum heat treatment of material. Subsequent experiments will verify our preliminary results.