APPLICATION**NOTE**

Smart Thermal Analysis: Measurements Wanted?

Dr. Alexander Schindler

Introduction

In day-to-day laboratory work, there are typical questions that often arise. For a new sample regarding analysis, what are the suitable measurement conditions such as temperature program, sample mass or the right crucible? And what measurement results can be expected? Perhaps such a sample was already measured by you in the past – or maybe by NETZSCH.

Wouldn't it help a lot to simply search in a database for thermal analysis? *Identify*, which is a part of the *Proteus*® analysis software, is the solution!

The primary function of the *Identify* database system is the automatic recognition and comparison of measurement curves. This serves, for example, for quality control and failure analysis. Pure data mining (storing, searching and finding of data) is, of course, the second main application.

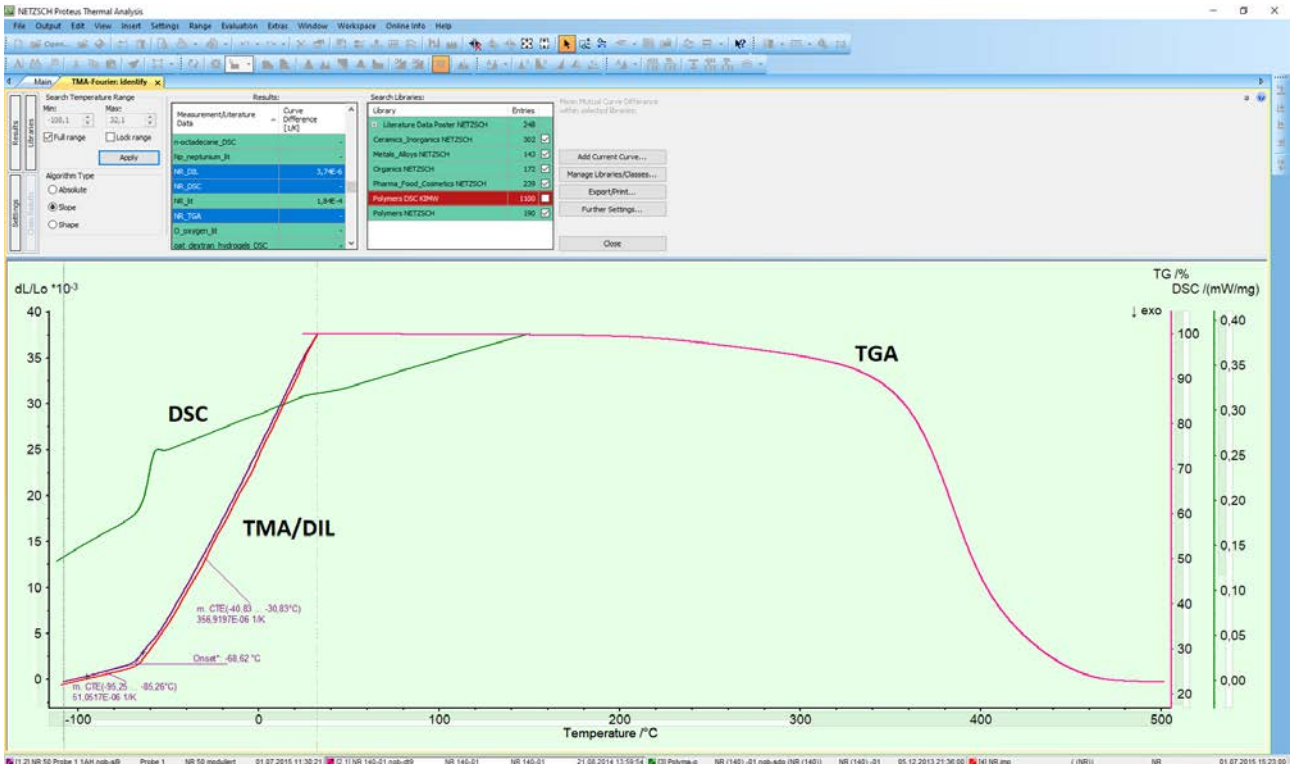
NGB · Application Note 204 · EN · 0121 · Technical specifications are subject to change.

NETZSCH-Gerätebau GmbH
Wittelsbacherstraße 42 · 95100 Selb · Germany
Phone: +49 9287/881-0 · Fax: +49 9287/881505
at@netzsch.com · www.netzsch.com

NETZSCH

How to Carry Out Data Mining with *Identify*?

One approach in using *Identify* is to search for similar database measurements or literature data on the basis of an input measurement curve. This is illustrated in figure 1, where a Thermomechanical Analysis (TMA) measurement is compared with various database curves for the same material. The similar TMA curve was found automatically by *Identify*, while the DSC and TGA curves in this case were found simply by alphabetical sorting of all database measurements shown. It is interesting to see that the glass transition occurs between -70° and -60°C (see also the Differential Scanning Calorimetry curve) and that the decomposition – which should normally be avoided in DSC or TMA measurements – starts slowly at above 150°C; this can be seen in the Thermogravimetry (TGA) curve.

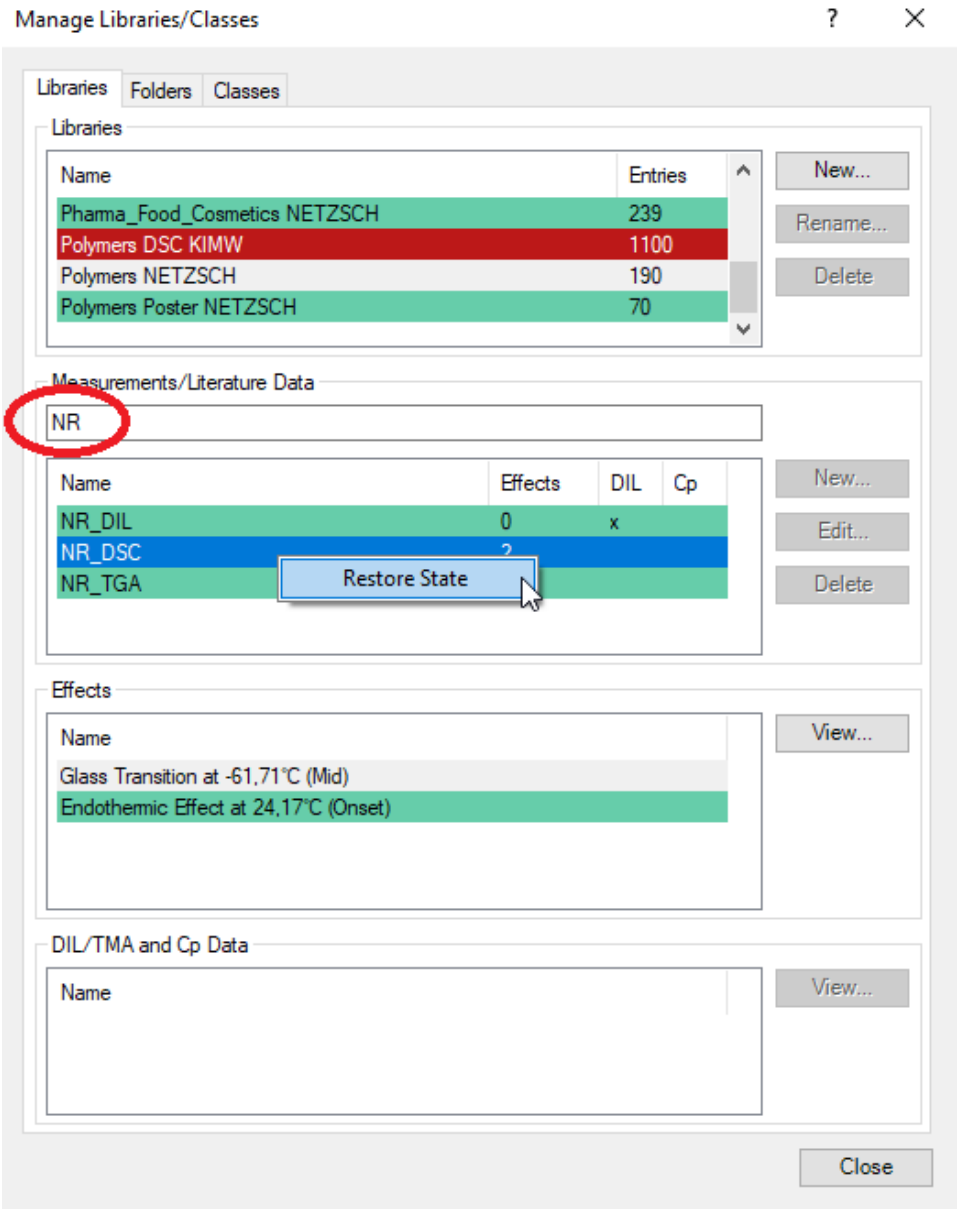


1 *Identify* database search based on a TMA curve of an NR (natural rubber) sample. Overlaid are a similar TMA curve, a DSC and a TGA curve of NR found in the database.

NGB · Application Note 204 · EN · 0121 · Technical specifications are subject to change.

NETZSCH-Gerätebau GmbH
Wittelsbacherstraße 42 · 95100 Selb · Germany
Phone: +49 9287/881-0 · Fax: +49 9287/881505
at@netzsch.com · www.netzsch.com

The second approach in data mining – in which no similar input measurement is required – is related to the "Manage Libraries/Classes" function (see figure 2). In this case, "NR" was typed manually into the search field for measurements and literature data, and consequently, the three different NR measurements were found. Right-clicking restores the database measurement to also reveal details of the measurement conditions such as temperature program, sample mass, purge gases and sample crucible.



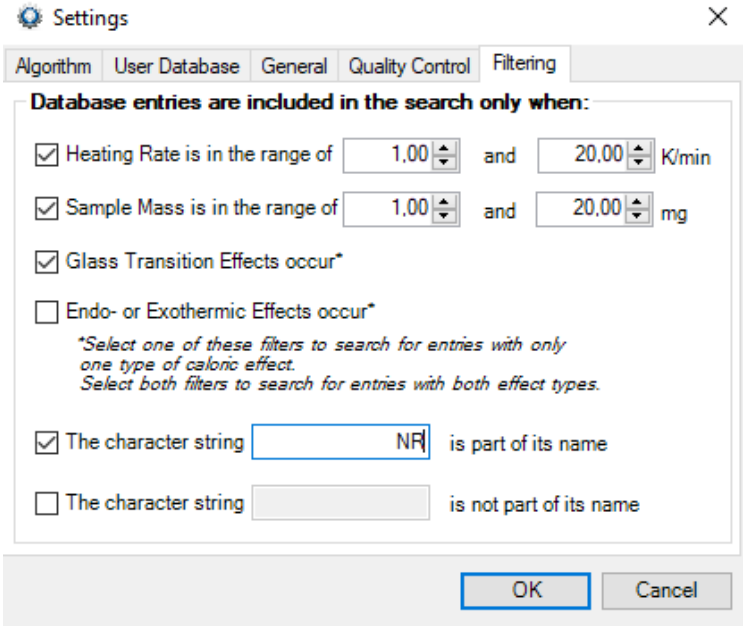
2 Searching within the *Identify* database using the name filter (indicated by the red circle)

NETZSCH-Gerätebau GmbH
Wittelsbacherstraße 42 · 95100 Selb · Germany
Phone: +49 9287/881-0 · Fax: +49 9287/881505
at@netzsch.com · www.netzsch.com

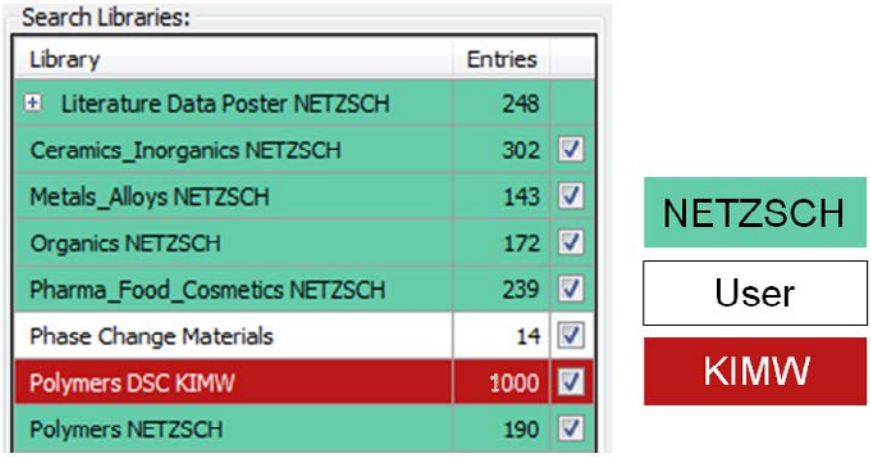
Last but not least, *Identify* also offers the ability to filter according to the heating rate and the sample mass, as well as according to whether glass transitions or endothermic and exothermic effects were evaluated. It is also possible to filter according to the occurence, or lack of occurence, of a string of letters in a measurement name (see figure 3).

The Database Content of *Identify*

Shown in figure 4 are the NETZSCH libraries, currently containing 1294 entries, which cover various application fields (ceramics, inorganics, metals, alloys, organics, pharma, food, cosmetics and polymers). Available as an option is the KIMW database developed by the Kunststoffinstitut Lüdenscheid, Germany, with DSC curves for 1000 different commercially available polymer grades; here information about the polymer supplier, color and filler material/content is also available.



3 Filter settings within *Identify*



4 *Identify* database contents: NETZSCH libraries, which are always included (1294 entries), the optional KIMW library (1000 entries), and in an example of a library created by the user.

NGB · Application Note 204 · EN · 0121 · Technical specifications are subject to change.

NETZSCH-Gerätebau GmbH
Wittelsbacherstraße 42 · 95100 Selb · Germany
Phone: +49 9287/881-0 · Fax: +49 9287/881505
at@netzsch.com · www.netzsch.com

Summary

Any measurement stored in *Identify* can be easily found and its associated measurement conditions and evaluations retrieved. This treasure chest of information can be helpful in advance of, or following, any measurement.

References

This article is also available as a blog:
https://ta-netzsch.com/smart-thermal-analysis-measurements-wanted

These previous released blog articles might also be of interest:
Smart Thermal Analysis (Part I): *AutoEvaluation* of DSC, TGA and STA curves
Smart Thermal Analysis (Part II): Identification of Measurements via Database Search
Smart Thermal Analysis (Part IIb): *Identify* … the Most Comprehensive Database in Thermal Analysis
Smart Thermal Analysis (Part III): *AutoEvaluation* of DIL and TMA curves

NGB · Application Note 204 · EN · 0121 · Technical specifications are subject to change.

NETZSCH-Gerätebau GmbH
Wittelsbacherstraße 42 · 95100 Selb · Germany
Phone: +49 9287/881-0 · Fax: +49 9287/881505
at@netzsch.com · www.netzsch.com