Dipl.-Ing. Axel Drieling (drieling@fibre.uni-bremen.de), Faserinstitut Bremen e.V. (-FIBRE-)

Use of the OFDA for Determining the Fineness Distribution of Bast Fibres like Flax or Hemp

For processing flax or hemp fibres the properties of the raw material like the fineness have to be known. Since the use of bast fibres is rapidly increasing e.g. for technical textiles, fast, objective and reliable methods for measurement have to be found.

The complexity of the structure of bast fibres is unique. As can be seen in the first figure a typical bast fibre consists of several cemented elementary fibres, so that there is no uniform shape of the cross-section.

Different methods are typically used for the determination of flax or hemp fibre fineness:

- Gravimetric measurement: Although no expensive machines are needed this method is not practical for commercial testing, because too much time is needed. Additionally only the average fineness may be tested, not the complete distribution.
- Airflow methods: Analysed is the resistance of a wad of fibres to the passage of air. Only the average fineness can be measured. Problems are caused by the indirect way of measurement. Different types of fibres or different degrees of retting lead to systematically changed results, regardless of the same fineness.
- Image analysis on cross sections: With this method it is possible to get detailed information about the distribution of the cross sections and on further aspects as the maximum possible fineness of the material. On the other hand it is very time consuming (for preparation and measurement) and there are many influences that reduce the reliability of the results.

With the OFDA, developed for fineness measurement on wool tops, another possible instrument for the measurement of the fineness distribution of bast fibres is given. Advantages of this instrument are:

- the entire distribution and not only the average fineness can be measured
- a very high number of fibres can be measured in a short time
- the influence of the technician on the results is minor because measurements are done automatically

Attention has to be paid to the fact that it is not possible to measure diameters of fibres but instead the width of the cross sections. This is important as the shape of bast fibres is not uniform and not circular. Typically the width of bast fibres measured with OFDA is larger than the diameter of a circle with the same cross-sectional area (Fig. 2).

In a research project carried out by the Bremen Fibre Institute (FIBRE) intensive investigations were done to prove and to improve the usability of the OFDA instrument for fineness measurement on flax and hemp fibres. Fibre preparation and measurement were adapted for this purpose. In detail fibre sampling as well as producing and spreading of fibre snippets were changed, the number of scans and the number of tests for each sample was increased.

The results show that it is possible to measure fineness distributions of bast fibres reliably. The results are in good correlation to those of gravimetric measurement and image analysis on cross sections. Deviations to the results of Airflow measurements are probably caused by influences on the Airflow measurement by other fibre properties than fineness (e.g. roughness of the fibre surface).

It can be concluded that the OFDA is an interesting alternative to other fineness measurement methods for bast fibres, as it is fast, the whole fineness distribution is displayed, and results are reliable as soon as the method is adapted to bast fibres.

Further information and the final report of the research project “Measurement of Bast Fibre Properties” (in German) with detailed description of the used and adapted measurement methods are available at:

Faserinstitut Bremen (Bremen Fibre Institute)
FIBRE
Wachtstr. 17-24
28195 Bremen
Germany
Tel. +49-421-218-9340
Fax +49-421-218-3110
e-mail: drieling@fibre.uni-bremen.de

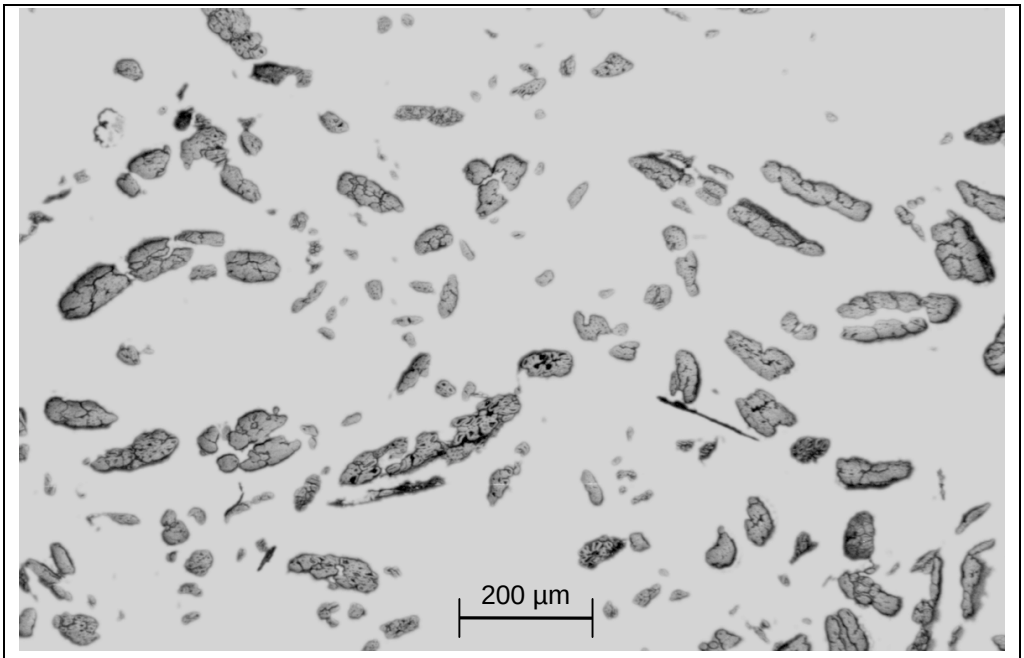
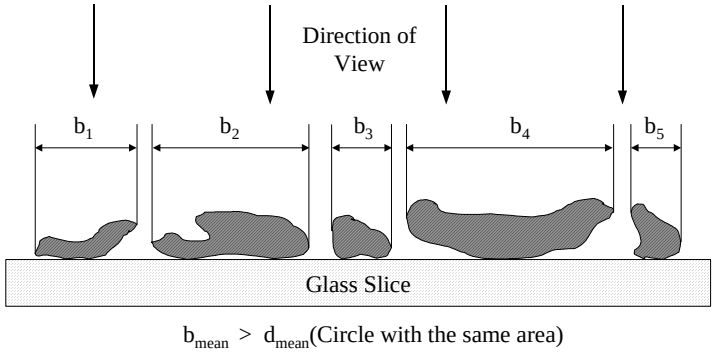


Fig. 1: Cross sections of retted hemp



$b_{mean} > d_{mean}$(Circle with the same area)

Fig. 2: Measurement of the fibre width with OFDA