Comparative AFM and SEM investigations on kraft pulp fiber surfaces

F. J. Schmied[1,4], C. Teichert[1,4], L. Kappel[2,4], U. Hirn[2,4], R. Schennach[3,4] and H. Schröttner[5]

1. Institute of Physics, University of Leoben, Franz Josef Str. 18, 8700 Leoben, Austria
2. Institute of Paper, Pulp and Fiber Technologies, Graz Technical University, Kopernikusgasse 24/II, 8010 Graz
3. Institute of Solid State Physics, Graz Technical University, Petersgasse 16/2, 8010 Graz
4. CD-Laboratory for Surface Chemical and Physical Fundamentals of Paper Strength, Graz Technical University, Petersgasse 16/2, 8010 Graz
5. Institute of Electron Microscopy and Fine Structure Research (FELMI), Graz Technical University, Steyrergasse 17/3, 8010 Graz

franz.schmied@stud.unileoben.ac.at

Keywords: AFM, SEM, cellulose, kraft pulp

The strength of fiber-fiber bonds is affected by various bonding mechanisms. Any of those can only be effective, when the fiber surfaces are in very close contact. The fiber surface morphology determines the closest approach of two adjacent fibers, as well as the size of the contact area. To study these effects, microscopies with nanometer resolution are required.

Here, we applied atomic force microscopy (AFM) and scanning electron microscopy (SEM) to investigate kraft pulp fiber surfaces after different treatments. AFM phase images revealed the fibrillar structure on the fiber surface. It was possible to obtain detailed structural information about the individual microfibrils and lignin precipitates on the fiber surface. However, only small parts of the fiber are accessible. As a complementary technique we used SEM to obtain information on a larger scale but with less resolution, due to problems with charging and damaging of the sample. Markers on the sample support allow measurements exactly on the same positions with both techniques. With this combination of techniques we have the access to high resolution information from the AFM and the global inputs – obtained from SEM - to investigate kraft pulp fiber surfaces from the micrometer scale down to the nanometer scale.

Supported by **Mondi**, Frantschach, and the **Christian Doppler Research Society**, Vienna Austria.

G. Kothleitner, M. Leisch (Eds.): MC2009, Vol. 1: Instrumentation and Methodology,
DOI: 10.3217/978-3-85125-062-6-148, © Verlag der TU Graz 2009

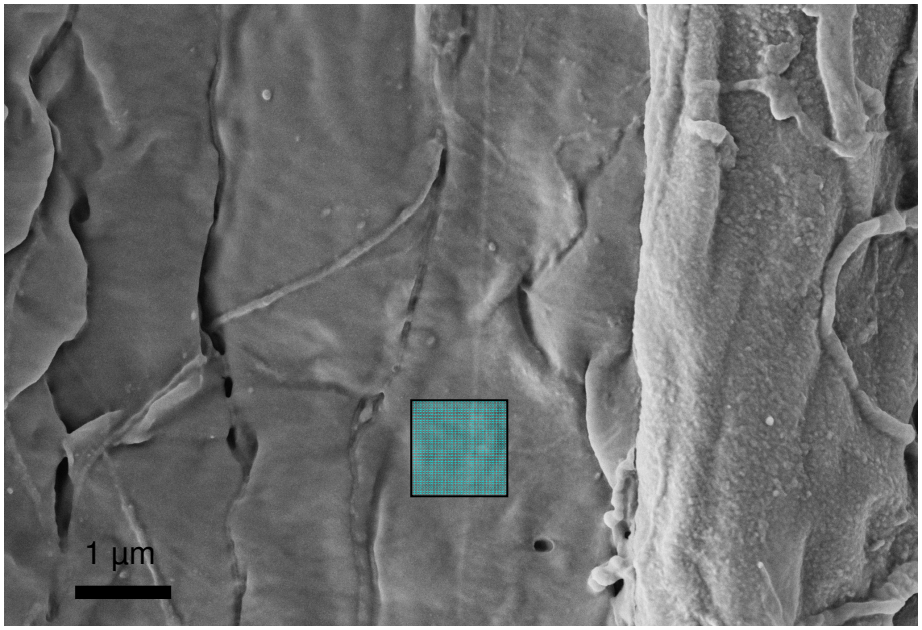

Figure 1. SEM image of a kraft pulp fiber surface. The inserted box marks the position of the corresponding AFM image presented in Figure 2.

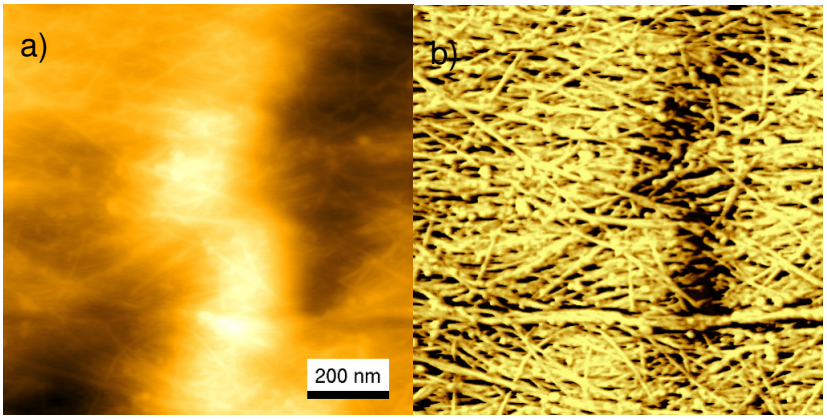

Figure 2. High resolution AFM images of the area marked in Figure 1. a) AFM height image (z-scale = 100 nm). b) corresponding phase image of a) (φ-scale = 50°)

G. Kothleitner, M. Leisch (Eds.): MC2009, Vol. 1: Instrumentation and Methodology,
DOI: 10.3217/978-3-85125-062-6-148, © Verlag der TU Graz 2009