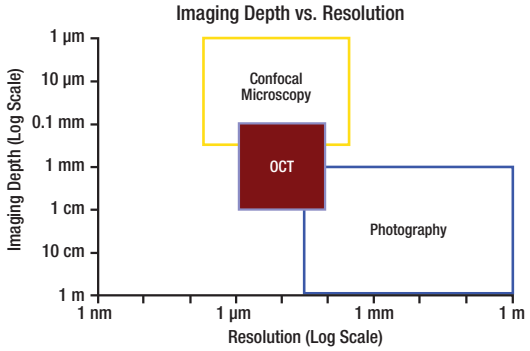
Biofilm Imaging

THORLABS
APP HIGHLIGHT

APPLICATION



OCT works in the mesoscale and bridges the gap between microscopic methods like Confocal Laser Scanning Microscopy (CLSM) and macroscopic methods like photography.[1]

QUICK FACTS

- OCT is a non-destructive, non-invasive imaging technique.
- Biofilm imaging is usually performed in water. Because spectral absorption in water is lower at 880 nm than at 1300 nm, OCT systems operating near 880 nm are preferred.
- No dyes are needed; OCT works by analyzing backscattered light.
- Imaging through a glass or PMMA window (such as in a flow cell) is possible.
- Typical interests include morphology and changes in morphology over time due to growth or external forces.
- OCT can image into biofilms and aids in the analysis of structural features such as pore density and size.
- Flow analysis is possible via Doppler OCT (Doppler mode included in all systems).

TYPICAL SETUP

- The OCT scan lens can be dipped in open water for imaging.
- The biofilm can be grown in a reactor and then be taken out and analyzed under the OCT scanner.
- Imaging in a flow cell setup is possible, as illustrated to the right.

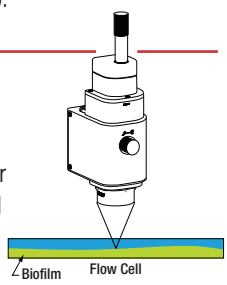
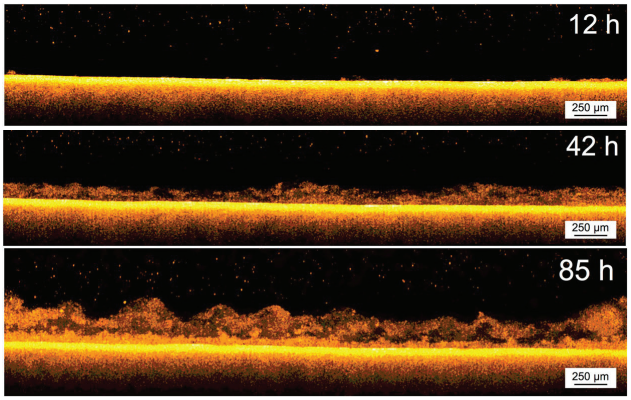
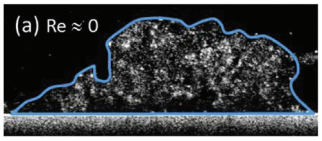


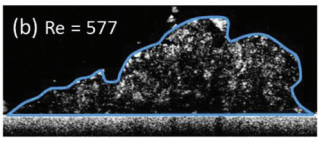
Illustration of OCTG9 Scanner and Flow Cell

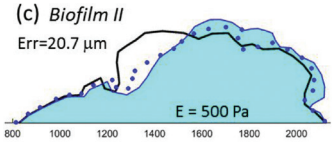
EXAMPLE IMAGES



Growth of biofilm on a membrane over several days. The accumulation of biofilm on a membrane leads to a significant reduction in performance and is therefore of interest in many industrial applications.[2,*]







Deformation of Biofilm Due to Sheer Forces: (a) Original Outline of the Biofilm, (b) Deformation Under Flow of Water from Left to Right, (c) Sketch Comparing the Structure With and Without Applied Force[3,*]

RECOMMENDED ITEMS

Choice of OCT System:

- **GAN312C1(/M):** For Standard Imaging of Thick Biofilms
- **GAN612C1(/M):** For Imaging Dynamic Processes

GAN632C1

- **GAN332C1(/M) or GAN632C1(/M):** For High-Resolution Imaging of Thin Biofilms

Useful Accessories:

- For Larger Depth of Focus: **OCT-LK4-BB** Scan Lens Kit and **OCT-RA4** Reference Length Adapter
- Recommended When Imaging Through More Than 10 mm of Water, Glass, and PMMA: **SRA10** Spacer Reference Arm
- Special Spacers and Reference Arms for Imaging in Open Water:
  - **OCT-IMM3-SP1 & SRA10** for OCT-LK3-BB Lens
  - **OCT-IMM4-SP1 & SRA30** for OCT-LK4-BB Lens

PUBLICATIONS

1) M. Wagner, D. Taherzadeh, C. Haisch, H. Horn, Biotechnol. Bioeng., **107** (5), 844, 2010
2) L. Fortunato, S. Jeong, T.O. Leiknes, Sci. Rep., **7**, 15, 2017
3) C. Picioreanu, F. Blauert, H. Horn, M. Wagner, Water Res., **145**, 588, 2018
4) K.J. Martin, D. Bolster, N. Derlon, E. Morgenroth, R. Nerenberg, J. Membr. Sci., **471**, 130, 2014
5) Y. Gao, S. Haavisto, C.Y. Tang, J. Salmela, W. Li, J. Membr. Sci., **448**, 198, 2013
6) C. Dreszer, A.D. Wexler, S. Drusová, T. Overdijk, A. Zwijnenburg, H.C. Flemming, J.C. Kruithof, J.S. Vrouwenvelder, Water Res., **67**, 243, 2014
7) N. Derlon, M. Peter-Varbanets, A. Scheidegger, W. Pronk, E. Morgenroth, Water Res., **46**, 3323, 2012
8) M. Wagner, H. Horn, Biotechnol. Bioeng., **114** (7), 1386, 2017
9) A.F. Rosenthal, J.S. Griffin, M. Wagner, A.I. Packman, O. Balogun, G.F. Wells, Biotechnol. Bioeng., **115** (9), 2268, 2018