

Plate Imaging Inserts for Meniscus Correction

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BACKGROUND

Phase contrast microscopy, first described in 1934 by Dutch physicist Frits Zernike, is a contrast-enhancing optical technique that can be utilized to produce high-contrast images of transparent specimens, such as living cells. Anomalies can be seen when using phase contrast microscopy in an environment where the meniscus at the air to medium surface interface results in a curved surface due to surface tension. The refraction at this interface results in a displacement of the surround wave light path away from the annulus ring for phase contrast imaging leading to a loss in contrast and even a loss of the image. The correction of this requires changing the interface so that it is parallel to the specimen carrier (Fig.1).

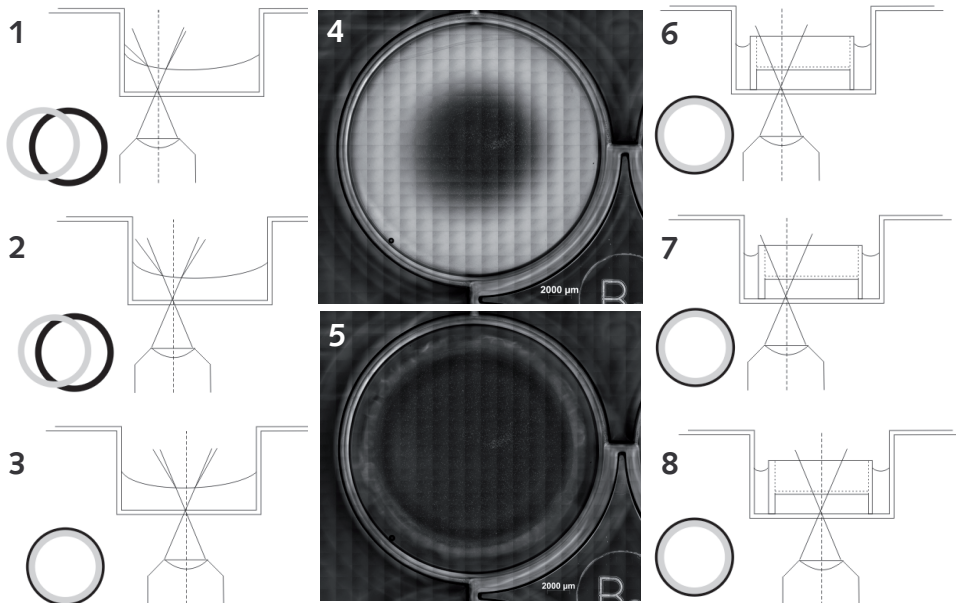


Fig1: 1-4: Meniscus causes a loss of the image when using phase contrast microscopy in liquids in plate wells; only a small area is available for measurements. 5-8: Optical insert leads to a parallel surface and results in a clear and focused image (4 and 5: mosaic image of 12 well plate scan; 10x magnification)

TECHNOLOGY

A construction carrying a coverslip parallel to that of the specimen carrier with an observation window allows observation of the specimen at large distances from the centre of the well without incurring distortion or loss of the image despite a small well size. The insert can be adapted for use in all sizes of multiwell plates where a correction of the optical interface for the reduction of refraction anomalies is necessary. In order to attain this the insert consists of a plastic tube with an optical disc sealing one end.

Example: 6 well format

The tube stands on three legs to maintain a parallel orientation of the disc to the observation surface. The insert is smaller than the well in which it is placed to enable gas exchange between the fluid medium and the surrounding gas atmosphere for the cells growing below it (Fig. 2).

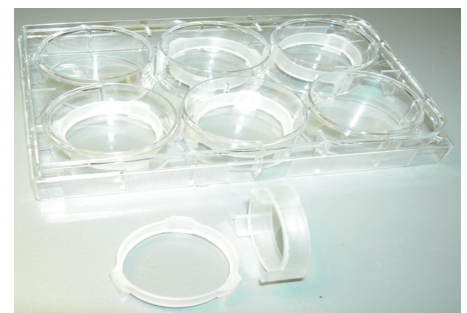


Fig2: 6 well plate with optical inserts

ADVANTAGES

...technical aspects

- simple
- inexpensive
- easily modifiable for several multiwell plate formats
- disposable or reusable variations
- autoclavable
- aeration of wells
- no expensive chemically modified plate material required
- any kind of well surface coating possible
- no complex optics required
- evaporation reduction

...for applications

- significant increase of the measurable area within one well
- less medium, fewer cells and fewer reagents required for single tests.
- every multiwell plate format applicable
- long term life cell imaging under physiological conditions
- enables automated analyses
- low and high throughput without cross contamination
- no special techniques required
- an ideal for routine applications

COLLABORATION DETAILS

- Collaboration can be in the form of a license agreement or a technical research cooperation for further development of the inserts
- Partner should provide support in manufacturing, marketing, advertising and/or distribution of the system

Possible Partners

- manufacturer or developer of optical devices used in microscopy
- manufacturer or developer of disposable or reusable laboratory products

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DEVELOPMENT STATUS

- Several working prototype models of optical plate inserts
- patent pending