Improved Crystal Detection of Protein Crystals by Bulk Contrast Enhancement

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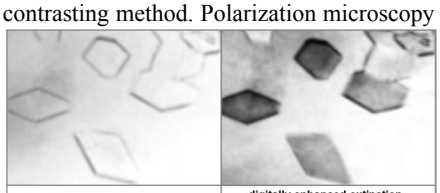
We present a computer-enhanced microscope that improves the reliable detection of small and colorless protein crystals in their native crystallization environment. Careful observation and evaluation of crystallization experiment pose a substantial burden on operator-based resources especially in high throughput crystallization operations. The presence of crystals is usually established by the observation of - frequently disguised - crystal facets, i.e. crystal edges in images. It is desirable to add a further contrasting method. Polarization microscopy does provide bulk color but this contrast is severely attenuated owing to the use of polymer-based birefringent crystallization trays.



We show how bulk contrast of micro crystals (grown in birefringent plastic trays and in lipidic cubic phase matrices) can be enhanced dramatically by digital processing of images that are captured with an automated extinction microscope (see figure). At first, images of crystallization experiments with different rotations of locked polarization extinction settings are captured. Then the colors are decomposed and numerical operations are applied on the respective grey-value matrices. The final combined false-color image shows protein crystals with enhanced bulk contrast. The configuration of the automated extinction microscope, its image processing algorithms and its usefulness for the detection of colorless protein crystals will be shown. We conclude that bulk contrast enhancement substantially aids the confident identification of crystals.

Keywords: crystal detection, image processing, lipidic cubic phase