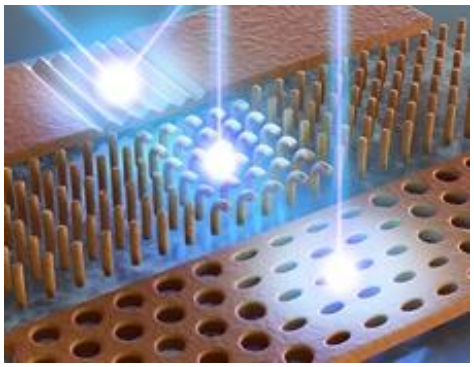
Release Date: February 23, 2022

LAM | Latest publications from prestigious teams

Light: Advanced Manufacturing published four reviews

1. LAM review | Photopatterning via photofluidization of azobenzene polymers

Shu Yang from University of Pennsylvania and colleague now report the recent progress of photoresponsive materials based on azobenzene and its derivatives (i.e., azobenzene polymers), which have attracted considerable research attentions due to their unique optical properties. Specifically, azobenzene polymers exhibit photo-isomerization involving molecular structure changes under specific wavelengths, thereby altering the intrinsic physical and chemical properties of the material. The most prominent change is the photofluidization of azobenzene groups under light irradiation, which can be directed anisotropically using polarized light. This phenomenon is dependent on light intensity and exposure time. Therefore, temporal control of this fluidization behavior can be used to manufacture complex micro- and nanostructures. The unusual photofluidic movement of azobenzene polymers can be effectively used in many applications, including optoelectronic devices, light-enabled self-healing electrical circuits, and liquid-purifying filters.



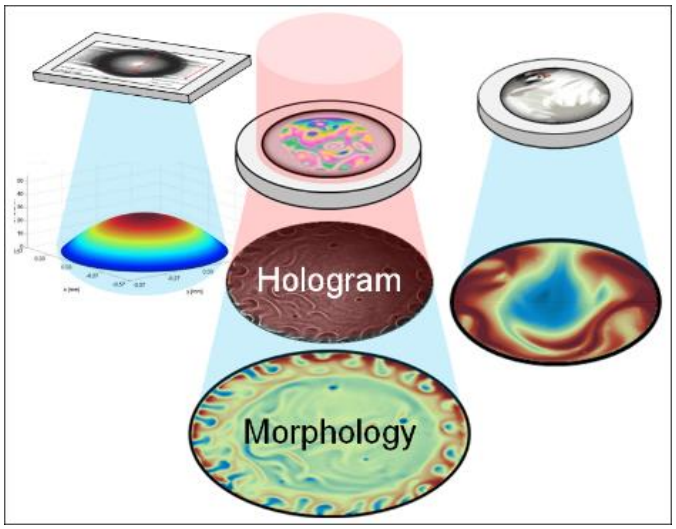
Caption | Schematic of photopatterning via photofluidization.

See the article:

Hong Suk Kang, Shu Yang. Photopatterning via photofluidization of azobenzene polymers [J]. Light: Advanced Manufacturing.
https://doi.org/10.37188/lam.2022.003

2. LAM review | Digital holography as metrology tool at micro-nanoscale for soft matter

The inherent characteristics of digital holography makes it an elective metrology tool. In fact, digital holography has attractive features for testing and monitoring soft-matter either in-situ and real-time. Holography allows non-contact, non-destructive, three-dimensional imaging, together with extended focus flexibility, 3D tracking, full-field analysis, and high sensitivity measurements for soft matter during bottom-up fabrication processes at multiple-scales. In this review, applications of soft-matter characterization using digital holography are reported, some examples are liquid and solid thin films, inkjet printing, EHD drawn fibers, polymeric lenses, micro-channels, hydrogel micro-scaffolds, photoresists, surface-relief-gratings, and particles. Optimal measurement approaches for different materials/processes were given and discussed. For the first time, a comprehensive overview of such a fascinating field of investigation is described where 3D-imaging and accurate measurements are merged into a single metrological tool to study soft matter for different applications.



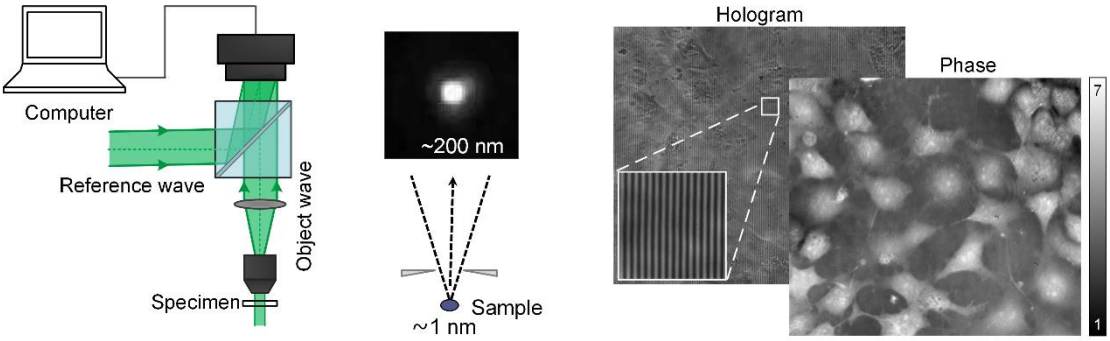
Caption | The inherent features of digital holography makes it a powerful tool for visualization and testing of soft matter, as well as in-situ and real-time characterization of bottom-up fabrication processes.

See the article:

Zhe Wang, Lisa Miccio, Sara Coppola, Vittorio Bianco, Pasquale Memmolo, Volodymyr Tkachenko, Vincenzo Ferraro, Ernesto Di Maio, Pier Luca Maffettone, Pietro Ferraro. Digital holography as metrology tool at micro-nanoscale for soft matter[J]. Light: Advanced Manufacturing. https://doi.org/10.37188/lam.2022.010

3. LAM review | Resolution enhancement of digital holographic microscopy via synthetic aperture: a review

Digital holographic microscopy (DHM) is a wide-field, minimally invasive quantitative phase microscopy approach for measuring the 3D shape or the inner structure of transparent and translucent samples. However, limited by diffraction, the spatial resolution of conventional DHM is relatively low, and therefore, tinny structures of samples can be not seen under conventional DHM. During the past decades, many efforts have been made to enhance the spatial resolution of DHM while preserving a large field of view (FOV). Peng Gao from Xidian University and Cao-jin Yuan from Nanjing Normal University present a comprehensive review of resolution enhancement approaches for DHM, which encompass illumination engineering, hologram extrapolation or synthesis, pixel super-resolution, and artificial intelligence (AI) approaches. They also discussed and summarized the advantages and disadvantages of these resolution enhancement approaches.



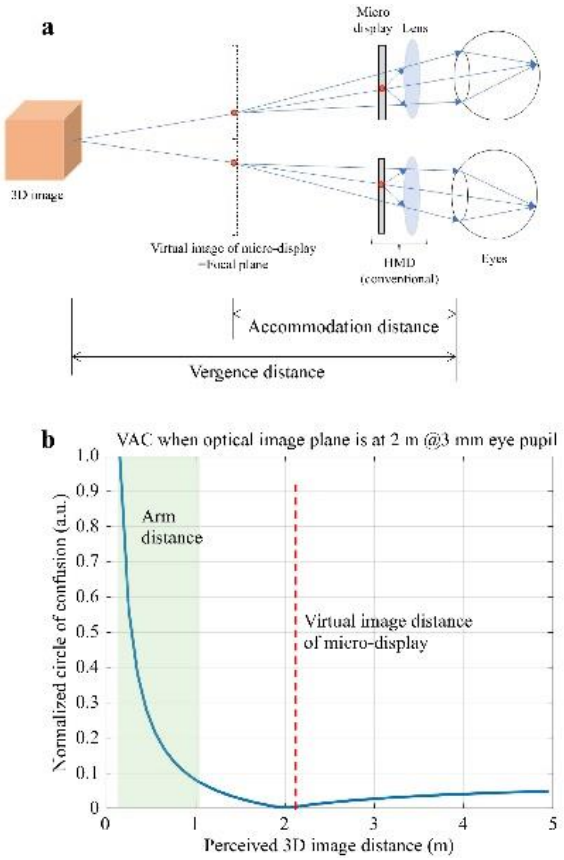
Caption | Schematics of Digital holographic microscopy (DHM)

See the article:
Peng Gao, Caojin Yuan. Resolution enhancement of digital holographic microscopy via synthetic aperture: a review[J]. Light: Advanced Manufacturing. doi: 10.37188/lam.2022.006

4. LAM review | Holographic techniques for augmented reality and virtual reality near-eye displays

Near-eye displays are glass-type wearable display devices that enable immersive presentation of virtual images in AR and VR applications. Compact form-factor, light weight, large field of view, wide eyebox, and natural 3D image presentation with proper focus cues are crucial requirements of the near-eye displays for a comfortable viewing experience and natural user interaction. In recent years, holographic techniques have been actively applied to implement these requirements, overcoming

the limitation of the conventional bulk optics and 2D display panels. Jae-Hyeung Park from Inha University and Byoungho Lee from Seoul National University review the recent progress in the application of the holographic techniques. By covering various applications such as static holographic optical components and dynamic holographic display devices, they provide a comprehensive overview of holographic techniques that are applied to AR and VR near-eye displays.



Caption | Vergence-accommodation conflict (VAC): a conceptual illustration, b degree of VAC represented in circle of confusion.

See the article:

Jae-Hyeung Park, Byoungho Lee. Holographic techniques for augmented reality and virtual reality near-eye displays [J]. Light: Advanced Manufacturing.
https://doi.org/10.37188/lam.2022.009

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