New polarizing microscopy technique based on LC SLM

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Optical microscope functions are limited by illumination distribution observation on the objects' surface in reflexion regime or absorption observation in transmissive regime. Polarizing microscope functions are expanded: internal tensions or optical chirality's in transparent material becomes visible. Unfortunately traditional optical microscopy doesn't give the possibility to detect the distribution of invisible physical fields such as electric, magnetic fields or structure inhomogeneities on the surface under investigation.

In the paper we suggest new type of optical polarizing microscope with more expanded functions that gives the possibilities to observe and detect the distribution of invisible physical fields or structural defects on the materials surface. The principle idea of new microscope is based on application in traditional polarizing microscope optical scheme new element based on liquid crystals (LCs) as unique recording media [1]. In common case it might be spatial light modulator (SLM) that can realize the local radiance modulation at defects area in real time.

The main advantage of new optical polarizing microscope (OPM) is the unique possibility to detect the invisible structure of materials and its defects and inhomogeneities with high sensitivity and spatial resolution. The receiving of such information is very important for material testing in material science, medicine and biophotonics [2]. New OPM was effectively used in cancer diagnosis and viruses detecting, solid crystals and minerals structure testing and etc.

The main disadvantage of the new OPM is the problem of reading and interpretation of obtained visual information, because the method gives at the same time integral information of all defects, for example both structural inhomogeneities and microrelief defects.

In the paper we suggest for the first time to solve the problem by combining the new OPM technique with confocal microscopy observation of the same objects. The efficiency of combined microscopy technique is illustrated by examples of evaporated samples of some vine solutions investigation. The special attention is devoted to the problem of samples wetting by LCs. The combined technique proves the new objective criteria for detecting the quality of different solutions: drugs, beverages and perfume. New microscope combined technique gives independent diagnostic information alternative to dyes and fluorescence methods and opens new horizons in examination of different material surfaces especially in the field of biophotonics.

References

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