Polarization and wavelength control using liquid crystals for integration into biomedical optical imaging systems

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Liquid crystal devices have been largely developed for liquid crystal displays and in the last decade for optical telecommunications, however their application in the field of optical imaging just started to emerge. These devices can be miniaturized thus have a great potential to be used with miniature optical imaging systems for biomedical applications. Liquid crystal devices designed specifically for integration into biomedical optical imaging systems will be presented. Using a combination of one or two LC retarders we obtained polarimetric imaging of the skin. LC tunable filters with high dynamic range and large throughput are designed for hyperspectral imaging and for spectral domain optical coherence tomography. The designs are based on several concepts both using the classical stack of retarders and using more modern designs based on single layer in a waveguide or in Fabry-Perot cavity. A miniaturized spectro-polarimetric (SP) imaging system for skin imaging will be presented that uses LC devices to control the wavelength and the polarization.