Public Abstract
First Name:Xin
Middle Name:
Last Name:Li
Adviser's First Name:Gang
Adviser's Last Name:Yao
Co-Adviser's First Name:
Co-Adviser's Last Name:
Graduation Term:SP 2009
Department:Biological Engineering
Degree:MS
Title:Propagation of Polarized Light in Skeletal Muscle

We measured polarization-sensitive optical reflectance and transmittance images in fresh skeletal muscles. Mueller matrix images were calculated to completely characterize muscle optical polarization properties. Polar decomposition algorithms were implemented to extract specific polarization variables from the measured Mueller matrix. The polarization images in muscle showed strong anisotropic spatial distributions which are very different from those obtained in isotropic tissue phantoms. The back-reflected light in muscle maintained better polarization along the axis perpendicular to muscle fiber orientation. The simulation results from a muscle diffraction model suggested that such unique features can be attributed to optical diffraction by the sarcomere, a periodic structure in skeletal muscles. Other tissue scatterers and the fibrous morphology of muscle fibers may also play roles in modulating the propagation of polarized light in muscle. The transmittance imaging results indicated that multiple scattering became dominant in thick samples. In summary, this study demonstrated that optical polarization can be applied to reveal unique muscle polarization properties.