Towards supercontinuum-driven hyperspectral microscopy in the mid-infrared

The extension of supercontinuum (SC) sources into the mid-infrared, via the use of fluoride and chalcogenide optical fibers, potentially offers the high radiance of a laser combined with spectral coverage far exceeding that of typical tunable lasers and comparable to traditional black-body emitters. Together with advances in mid-IR imaging detectors and novel tunable filter designs, such supercontinua hold considerable potential as sources of illumination for spectrally-resolved microscopy targeting applications such as rapid histological screening. The ability to rapidly and arbitrarily select particular wavelengths of interest from a broad emission spectrum, covering a wide range of biologically relevant targets, lends itself to image acquisition only at key relevant wavelengths leading to more manageable datasets. However, in addition to offering new imaging modalities, SC sources also present a range of challenges to successful integration with typical spectral microscopy instrumentation, including appropriate utilisation of their high spatial coherence. In this paper the application of SC sources to spectrally-resolved microscopy in the mid-IR is discussed and systems-integration considerations specific to these sources highlighted. Preliminary results in the 3-5 μm region, obtained within the European FP7 project MINERVA, are also presented here.

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