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Paper:Â 'Development and integration of xerogel polymeric absorbance micro-filters into lab-onchip systems

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Abstract: This work reports on the implementation of different absorption micro-filters based on a dye-doped hybrid organic-inorganic xerogel polymeric material synthesized by the sol-gel process. Microstructures containing eight different filter widths were fabricated in polydimethylsiloxane (PDMS), bonded to glass substrates and filled with the corresponding dye doped polymeric material by a soft lithography approach. The filtering capacity as a function of dye concentration and filter width was studied and revealed a linear dependence with both parameters, as expected according to the Beer-Lambert law. Zero passband transmittance values and relatively sharp stopband regions were achieved with all the filters, also showing rejection levels between -6 dB and -55 dB. Finally, such filters were monolithically integrated into a disposable fluorescence-based photonic lab-on-a-chip (PhLoC) approach. Calibration curves carried out with a model fluorophore target analyte showed an over two-fold increase in sensitivity and a thirty-fold decrease of the limit of detection (LOD) compared with the values recorded using the same PhLoC system but without the polymeric filter structure. The results presented herein clearly indicate the feasibility of these xerogel-based absorbance filtering structures for being applied as low-cost optical components that can be easily incorporated into disposable fluorescence-based photonic lab on a chip systems.Â