Temperature sensing using CdSe quantum dot doped poly(methyl methacrylate) microfiber

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Abstract

This work describes noncontact temperature measurements using wavelength shifts of CdSe quantum dot (QD) doped poly(methyl methacrylate) microfiber. The sensor is fabricated using a drawing method by bridging two tapered single mode fibers with a polymer microfiber (PMF) approximately 3 μm in diameter. A set of a PMF section with and without the doping of the CdSe-ZnS core-shell QD was applied as sensing probes and used to measure temperatures over the range of 25°C–48°C. The experimental results show that the doped PMF is able to achieve a higher performance with a reasonably good sensitivity of 58.5 pm/°C based on the wavelength shifting, which is about 18 times that of the undoped PMF temperature sensitivity. The proposed sensor showed a linear temperature sensing range that matches well with the physiologically relevant temperatures. Moreover, these results open the way for long-term and high-stability realization of temperature sensing optical fibers.