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Integration of β-$NaYF_4$ Upconversion Nanoparticles into Polymers for Polymer Optical Fiber Applications*

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Producing active polymer optical fibers (POFs) is a key step towards new applications such as fluorescent fiber solar concentrators (FFSCs), sensors, contactless coupling devices, or fiber integrated light sources and lasers. Therefore, integration of fluorescent nanoparticles into the polymer matrix is necessary and becomes accessible via *in situ* polymerization. For optical applications, the polymer has to fulfill various requirements such as chemical and physical stability, optical transparency in the application-relevant spectral region as well as a good synthetic accessibility. A common material for these is *poly*(methyl methacrylate) (PMMA). The β-phase $NaYF_4:Yb^{3+}, Er^{3+}$ upconversion nanoparticles (UCNP) were synthesized from the rare earth salts via thermal decomposition method in high-boiling point solvent 1-octadecene and capping agent oleic acid. Current results show hazy samples of the polymer with integrated nanoparticles made from monomer solution of methyl methacrylate. However, further optical tuning such as increasing the transparency of the bulk samples by changing the monomer solution to non-polar *n*-butyl methacrylate (*n*ButMA) or cyclohexyl methacrylate (CHMA) or further optimization of the UCNP shell could lead to more suitable polymer bulk samples.

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