

Polymer optical fiber compound parabolic concentrator tip for enhanced coupling efficiency for fluorescence based glucose sensors - DTU Orbit (08/11/2017)

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We demonstrate that the light excitation and capturing efficiency of fluorescence based fiber-optical sensors can be significantly increased by using a CPC (Compound Parabolic Concentrator) tip instead of the standard plane-cut tip. We use Zemax modelling to find the optimum CPC tip profile and fiber length of a polymer optical fiber diabetes sensor for continuous monitoring of glucose levels. We experimentally verify the improved performance of the CPC tipped sensor and the predicted production tolerances. Due to physical size requirements when the sensor has to be inserted into the body a non-optimal fiber length of 35 mm is chosen. For this length an average improvement in efficiency of a factor of 1.7 is experimentally demonstrated and critically compared to the predicted ideal factor of 3 in terms of parameters that should be improved through production optimization.

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