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### Abstract

One of the most critical features of an evanescent wave fiber optic biosensor is the design of the fiber probe's sensing region. The initial fibers tested exhibited poor sensitivity, primarily due to loss of fluorescent signal which was collected by the sensing region but which failed to propagate back in the clad fiber due to V-number mismatch. Earlier work has shown that tapering of the sensing region improves coupling of the fluorescence signal. While sensitivity was increased, there was a lack of reproducibility of signal magnitude from fiber to fiber. To produce a more consistent fiber probe which maintained sensitivity, signal return along the length of the probe was investigated. An effective design, termed a combination taper, was found which provided an even signal return along the fiber's length. The fiber tapers down to the V-number matching radius over 1 cm, maintaining total internal reflection, then continues to taper gently along the

following 9 cm to near the distal end. The combination taper fiber provides not only the desired sensitivity, but also improved reproducibility.



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## Keywords

evanescent fiber optic immunosensor; optical waveguide

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