Wearable and transparent contact lens sensors for diabetes diagnostics wirelessly

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Healthcare applications of wearable and smart contact lenses which can monitor human health conditions noninvasively with function of wireless transmission have attracted substantial interests due to the capability of direct detection of biomarkers contained in body fluids. However, previously reported contact lens sensors can only monitor a single analyte at a time. Furthermore, the sensors integrated on the real contact lens without obstructing the field of vision are not yet been realized. In this talk, we presented a multifunctional sensor on actual soft contact lens based on a RLC circuit, where R (resistance) responds to molecular binding of glucose in tear fluid while L (inductive) and C (capacitance) change in accordance with structural changes of the contact lens induced by varying intraocular pressure. This contact lens device based on hybrid nanostructures using two-dimensional graphene and one-dimensional metal nanowire exhibited high transparency, superb stretchability, and hence enabled the device to be fittable on soft contact lenses with wireless sensing capability. Furthermore, *in-vivo* and *ex-vivo* tests using a live rabbit and bovine eyeball demonstrated its reliable operation. Our developed contact lens sensor can measure the glucose level in tear fluid and intraocular pressure simultaneously but yet independently.