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The Application of Poly Acrylic Acid as a pH Sensitive Hydrogel in WGM Resonators

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In today's day and age, we have made so many advancements in the field of biocompatible medical devices. Some of the most widely used biocompatible material are hydrogels. Their unique properties such as high water content, softness, flexibility, and biocompatibility have made hydrogels very popular. Currently, hydrogels have a well-established role in the manufacturing of contact lenses, hygiene products, tissue engineering scaffolds, drug delivery systems and wound dressings. Many hydrogel-based drug delivery and scaffolds have been designed, studied and in some cases even patented, however, not many have reached the market. Because hydrogels have a large resemblance to living tissue, it opens many opportunities for applications in biomedical areas, particularly internal drug delivery.

A key component when using hydrogels in drug delivery is understanding how the gel reacts in various environments. Often times when placed in a different environment the hydrogel will start to swell or shrink. Swelling of the gel is extremely important for the release of the drug into the body. We have decided to focus on how changes in pH affects the hydrogel. After much trial-and-error it has been found that poly acrylic acid (PAA) serves as a pH-sensitive hydrogel. Because this creates an extremely acidic solution, when the gel is in a basic or even neutral environment the hydrogel swells to three times its original size. Because we need to be able to electronically control the hydrogel, another important component is the gel's ability to retain the light properties of a microresonator, which is something that has not been perfected, but has strong promise for future projects.