



HYDROGEL-BASED DEHYDRATION SENSOR BIOADHESIVE

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In the medical field adhesives are used on bandages, sensors, surgical tape, and many other applications. These are called pressure-sensitive adhesives (PSA) because they remain an adhesive (no hardening or chemical reaction taking place) and can be removed if desired. [1] Adhesives are made today using various synthetic materials, but nature has been making them all along. Modern synthetic materials have adapted these natural techniques from insects and animals to improve the adhesion. Adhesion for a hydrogel-based dehydration sensor will be work on the skin which makes it a bio-adhesive. The interactions of the adhesion and the surface of the skin primarily occur with the mucus layer (such as sweat or saliva). This phenomenon is called 'mucoadhesion' [2]. The main purpose of this research to develop and test a new bio-adhesive with mucoadhesion properties that will bind to the inside of the cheek and to the testing hydrogel with the sensor.

To accomplish this, many compositions were made in the lab to ensure that we optimize properties in the gel that align with what our desired outcomes are. For the hydrogel adhesive we needed the ions to pass through the adhesive to be able to flow into the testing hydrogel. To test this a QCM or Quartz Crystal Microbalance was used. This test works by running a solution into the sample and recording the change in frequency. From the Sauerbrey equation we know that the change in frequency is directly related to the change in mass. The QCM records the change in mass and the change in frequency. I tested this with both a water solution and a solution containing the ions that are present in saliva. To test the adhesive properties each composition was tested on a sample of raw chicken breast. The chicken breast resembles the same mucosal properties as seen on the inside of the mouth and when wettened the adhesive shows a bonding mechanism with the surface.

References

- [1] C. Creton, "Pressure-Sensitive Adhesives: An Introductory Course," *MRS Bulltion*, vol. 28, no. 6, pp. 434-439, June 2003.
- [2] S. A. M. a. J. D. Smart, "An investigation into the role of water movement and mucus gel dehydration in mucoadhesion," *Journal ofcontrolled Release*, pp. 197-203, 1993.