

Section III: Results

After conducting the compression test on each sample, it was found that the 5% alginate sample with 0.5 grams of nanoparticle gelatin proved to have the highest weight threshold as seen in Figure 1. While gelatin is biodegradable, its addition to the 5% alginate solution in comparison to the other nanoparticle addition was significantly higher. The Force/Area which is measured in Pascals as seen on the y-axis, was measured

by taking the force provided from the original testing and dividing it by the cross-sectional area squared. The units of Pascals in Newtons per meter squared, so each millimeter measurement was divided by one thousand to get the meter measurement. The formula to find the cross-sectional area is pi times the radius squared. This was calculated by taking the average of the two length measurements taken manually before the compression tests, dividing it by two to find the radius, and then squaring this value. Once the value for the cross-sectional area was calculated, it was divided into the force that the universal

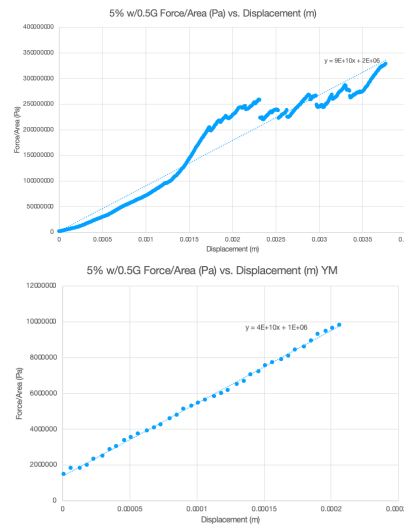


Figure 1: Force/Area vs. Displacement graph for 5% alginate solution with 0.5 grams of gelatin. Using a universal testing machine, the force and displacement of each sample was measured while conducting a compression test. The Young's Modulus of each sample was then taken, and the 5% alginate sample with 0.5 grams of gelatin had the highest slope of all the samples.

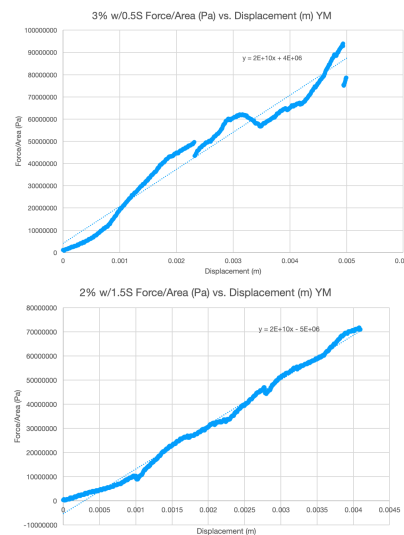


Figure 2: Young's Modulus Graphs for a 2% and 3% alginate sample. A universal testing machine was used to conduct compression tests on each sample, using a 200 Newton load cell at a speed of 10 millimeters per minute. The results above are the Young's Modulus of a 3% alginate sample with 0.5 grams of silica, and one of a 2% alginate sample with 1.5 grams of silica, both with similar slopes.

testing machine provided and then graphed in Excel. As seen in comparison to the graphs of the samples in Figure 2, the Young's Modulus of one 2% and 3% alginate

sample were measured, showing the slope to then analyze further. The slopes for every sample were measured, however, Figure 2 shows an example of two of these samples. Further, a preliminary

compression test showed that the 2% alginate concentration with the most grams cross-linked, had the

highest weight threshold. As shown in Figure 3,

the more grams of alginate that were used to

form the hydrogel, the higher the weight

threshold it had due to the solution having more

alginate than distilled water in it. In other

words, more of the solution consisted of

alginate, which is a known food thickener, leading to its higher weight threshold.

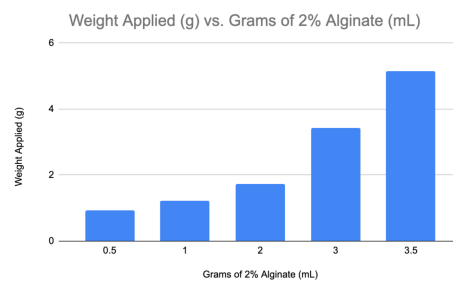


Figure 3: Weight Applied vs. Grams of 2% Alginate. Different grams of a 2% alginate concentration were cross-linked with calcium chloride for twenty-four hours, and then tested for their weight threshold. Using a metal, wooden, and plastic ball to conduct a mock compression test, the weight applied before rupture was recorded and graphed.