

The aims of this essay are about being able to investigate and to try and understand the Tensile Properties of certain materials.

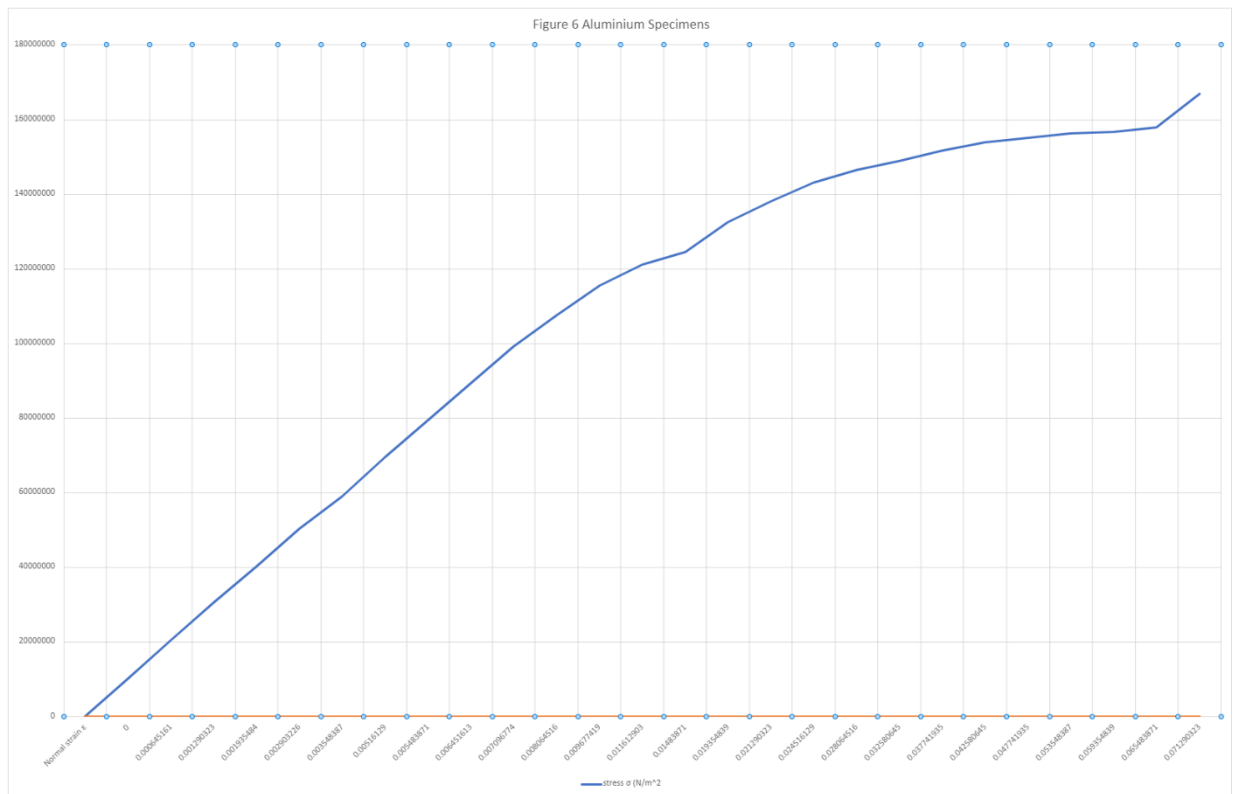
One of the most basic and common types of mechanical testing is the tensile test, commonly known as a tension test. Tensile testing involves applying tensile (pulling) force to a material and measuring the specimen's reaction.

So for example, In our Tensile Test, the materials used were a small piece of Aluminium and another small piece of Steel. The purpose of the Tensile test would be to gradually increase the tension or 'pulling force' on the subject to see how much elasticity the certain subject has, but also to test the strength of the subject. This test method is used to determine the Yield strength, ultimate Tensile strength, ductility, strain hardening characteristics ,Young's modulus and Poisson's ratio.

To conduct this test, the subject is put into the subject into the Tensile Tester, and twist the Load Nut in stages of 0.2mm up to 5mm. Each time you should give it five to ten seconds when taking results to make sure it is the most accurate result possible. If the subject has not snapped yet, you continue increasing the force applied by the Load Nut by an increased 1mm and 10mm until eventually the sample fails. The number of cycles taken until the sample breaks will the target to be measured.

However, the results will differ depending on the types of material which are being tested. For example, the results that you get from a metal material would not be the same as the results which you would get from testing a PVC material. So, when testing metal, normally you should leave it for the five to ten seconds before taking your result, Whereas when taking results for PVC materials you usually take the result straight away due to the dial indicator slowly drops each time you turn the Load Nut after the yield point and potentially continue dropping for some time afterwards. Hence why the result is recorded as soon as possible as this gives you the best result before the dial indicator drops due to the extension of the sample.

The change in dimension of a bar formed of an isotropic elastic material under tensile or compressive loads can be calculated using Young's modulus. For example, it can forecast how much a material sample would stretch or shorten under stress or compression. When a load is applied between the beam's supports, Young's modulus is also utilised to forecast the deflection that would occur.



When we conducted our own Tensile test in the lab, the materials that we were given to test were a small piece of Aluminium and a Small piece of steel. The graphs above show the stress applied to the two different materials that we were given to test when we had our lab session.

As we can see the two different samples gradually had their stress increase as the samples were being put through the Tensile Tests. Both materials stretched as the stress was being applied to them. However, if we look at the aluminium sample, we can see that the stress on this material was a little bit different to the results we found when testing steel. We can see both materials stretched before failing and breaking in the Tensile Test, But stress which was applied to the aluminium sample gave us a slightly different result. This result shows us that when more force was applied to essentially pulling the sample piece apart, the sample would incur more stress as it is reacting to being pulled away from itself, so it ever so slightly stretch in length and got thinner (due to Poisson's Ratio).

If we look at the Steel sample graph, we can see the same thing happened in the sense that the sample gradually got stretched out when we were putting it through the test. However, the Steel sample reacted a bit different to the Aluminium sample. We know this from looking at the two lines on each graph that the steel had a bit more of a curved increase in the lines gradient whereas the aluminium was at much more of a stable increase.

When it comes to PVC materials, (which are Polyvinyl Chloride Polymers) there are also other many important factors such as the Temperature. PVC materials can be manipulated when they go through a change in temperature. So for example, when a Polyvinyl Chloride material is heated up, if it was to be put in to the Tensile Test the result would be different to what it would be when a PVC material is left at room temperature. This is because when you heat up a PVC material, it becomes significantly weaker to what it would be if it had not gone through a change in temperature as the material becomes much softer. This means that when a PVC material is made cooler, the properties of the material become stronger as they have a much closer bond. This is why the temperature of the sample is also taken into consideration as it can often alter the end result in which we would finish with.

Another factor that is important when it comes to testing PVC materials is the constant force application rate. The biggest contributor to tablet mechanical strength and capping was the rate of force application (RFA). When the goal force was more than the force required for robust interparticulate bond formation, the resulting high Rate of Force Application contributed to more pronounced air entrapment, uneven force distribution, and stratified densification in compact, as well as high viscoelastic recovery.