INTRODUCTION:

Although a study of the impact on specimen thickness and its tensile strength of several metals is already out in the scientific community, there had been no research in the impact of the surface finish of very thin specimens and the tensile stress changes that it made. In order to solve this problem a research in this subject was started, several samples of different thicknesses and surface finishes that range between 2500 and 4000 grade paper were tested.

The samples then were tested in a 25SN Axial tensile test machine, pulled and given a gradually increasing amount of stress to its cross sectional area, the data was then analyzed and put into tables and graphs, the results confirmed that there is actually a change in the mechanical properties of the material the thinner they get, the samples required less stress in their cross sectional areas in order to fracture. The final goal was to obtain a trend that could predict or at least suggest that there is an optimal thickness and surface finish that yields the greatest amount of stress applied to the sample before it fractured.

PROCEDURE:

To obtain good samples with small variations of thickness through their length very careful polishing was used. The samples 20 mm in length and 2 mm in width were glued with cyanoacrilate to a glass slide cover to insure a flat surface for the polishing procedure then the system was glued to a metal disk that assembled into a device to measure the thickness that one needs to be removed, after a certain thickness the sample was removed with Acetone and then flipped.

After this procedure was repeated several times, and sometimes starting all over again the time came to obtain information. The samples were tested for their tensile strength in a MTU MicroTester. Velve grips were used to hold the sample in place and put it under Axial stress, the data gathered created a tensile stress graph that aided in the visualization of the forces involved in all the phases of elastic modulus of the metal, the ultimate yield strength and the fracture point.

The Stress is the amount of force that a material is sustaining per unit area, and the Ultimate Stress that was obtained was by looking at the trend and watching the biggest amount of stress that the material could sustain during all of the testing. The samples were then measured by hand and the change in length was compared to the % Strain that was reported in the graphs.

CONCLUSION:

After putting the data together in a spreadsheet a calculation of the stress was reacted in order to get the ultimate stress of the sample. Stress comes from the equation:

\[ \sigma = \frac{F}{A} \]

The Stress = Axial Force (N)/Cross Sectional Area (mm²)

It was shown during the experiment that thickness does make a change in the mechanical properties of a metal, more data, time, techniques, experiments and equipment are needed to determine whether there is a mathematical trend which can model such changes in the properties of metallic materials. Regarding the question of whether surface finish of such metals affect an effect it is still unknown due to the short term nature of the program that organized this investigation; but it was very substantial for me and the parties involved in the learning that we obtained from this investigation. Only this part was not clarified, and the effects of surface thickness were confirmed and analyzed.

As I stated before, the other conclusion that I have is the following: I learned a lot with this investigation, even with the relatively small amount of time that was given, a great wealth of knowledge and passion were revealed. I feel that this program has given me the opportunity to look to the present, see and appreciate what things have been accomplished and what is currently being done, it has given me the opportunity to look beyond to the future and watch with great emotion and excitement what is that will come. It has helped me learn how to use several skills and it has refined and taught me many things that will serve me forever through the rest of my life. It has reinforced my love for science and engineering and has propelled me to try to do even-greater things in the future for the advancement of mankind in its quest to reach the ultimate knowledge; to make even greater things, accomplish greater and more difficult undertakings, and live in peace among nations in balance with our environment. It has taught me most of all that science is a human necessity that unites and intrigues people from every country making it the thing that is the most essential to our nature and what is making better, every single day.

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