

FINAL PROJECT PROPOSAL

**Characterization of Microstructure and Tensile Strength of Heat Treated
Stainless Steel (SS) and its Potential for Super Strong Archwire**

Propose as one of the requirements of bachelor degree in Mechanical Engineering

By:

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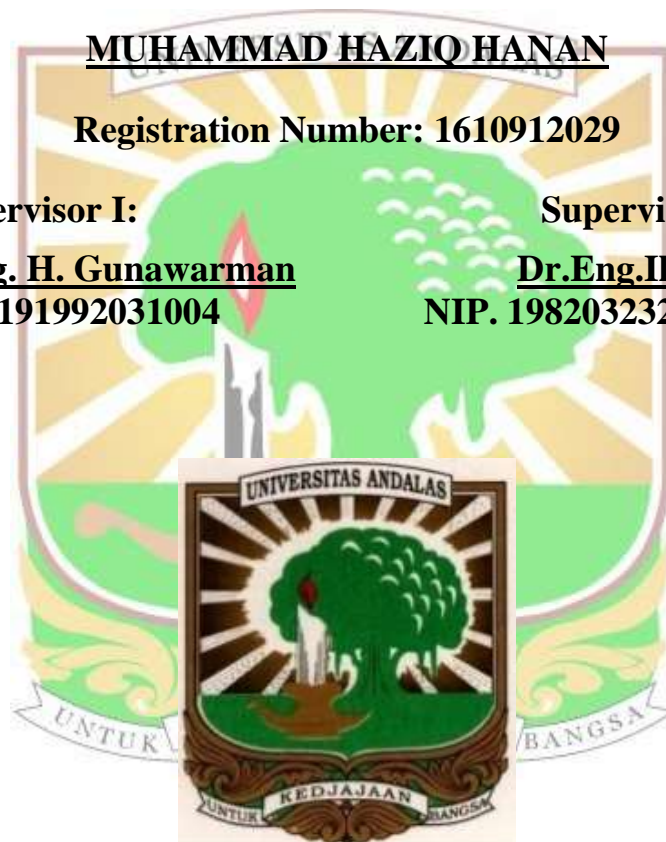
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Characterization of Microstructure and Tensile Strength of Heat Treated Stainless Steel (SS) and its Potential for Super Strong Archwire

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ABSTRACT

Misaligned teeth had been a common problem for people. Orthodontic therapy is used to fix irregularities of the teeth such as malocclusion and often by the use of braces. One of the major components of orthodontic therapy is archwires. Archwires are defined as devices comprising a wire conforming to the alveolar or dental arch, which is used as an anchorage for correcting irregularities in the position of teeth. The material used for the archwire should have good elasticity and strength. Several alloys meet these criteria and have been used as orthodontic archwires, such as stainless steel, cobalt–chromium alloy, titanium–nickel alloy, titanium–molybdenum, and titanium–niobium. Among the alloy, stainless steel is most widely used material and available in Indonesia's market. The purpose of this studies are to measure and compare the changes in hardness, tensile strength, and microstructure of archwire with stainless steel as the material before and after the heat treatment occurs. These analysis used dependent variable and that is time in the heat treatment. Time variation in the heat treatment that used are 5 min, 7 min, and 9 min with 450°C as the temperature. Independent variable that are hardness, tensile strength, and microstructure. This research shows an increment with the range of 27%-65% after it was heat treated. After that, the increment in tensile strength around 9-45%. In microstructure it can be seen that the precipitation occurred in the archwire. Due to the precipitation of the $M_{23}C_6$ the chromium started to deplete in the area along the grain boundaries. It was one of the reason why the hardness and the tensile strength of the archwire increased.

Keywords: *orthodontic, archwire, stainless steel, hardness, heat treatment, tensile strength, microstructure*