**Title :** **Influence of Equal Channel Angular Pressing (ECAP) on the Microstructure and Mechanical Properties of Aluminum Alloy 6061**

**Author(s) :** **1.** Kanyanat Srisom **Student ID :** 650510391
**2.** **Student ID :**
**3.** **Student ID :**

**Major :** Materials Science

**Advisor(s) :** **1.** Assistant Professor Dr. Chaiyasit Banjongprasert
**2.**
**3.**

**Type of presentation*** ***(choose 1)*** **:**

- ☐ **Oral Presentation** (เฉพาะ ตัวแทนนศ.ที่สาขาเลือกให้นำเสนอแบบบรรยาย)
- ☑ **Poster** (กรณี นำเสนอผลงานปัญหาพิเศษ/การค้นคว้าอิสระ)
- ☐ **Cooperative Education** (กรณี นำเสนอผลงานสหกิจศึกษา)

# ABSTRACT

This research investigates the influence of the Equal Channel Angular Pressing (ECAP) process on the microstructure and mechanical properties of Aluminum–Magnesium–Silicon Alloy 6061, a precipitation-hardenable alloy widely used in structural applications due to its favorable strength-to-weight ratio and corrosion resistance. ECAP, a Severe Plastic Deformation (SPD) technique, is recognized for its ability to produce ultrafine-grained (UFG) materials and enhance mechanical performance without altering specimen geometry.

Cylindrical Aluminum Alloy 6061 specimens with a diameter of 20 mm and a length of 100 mm were used. Prior to ECAP, the samples underwent solid solution treatment at 530 °C for 1 hour followed by rapid quenching to achieve a supersaturated solid solution and a homogeneous initial microstructure. This pre-treatment ensured controlled evaluation of deformation-induced microstructural evolution.

ECAP processing was performed using a die with an internal channel angle ($\phi$) of 90° and an outer curvature angle ($\psi$) of 20°. Pressing was conducted at 150 °C to reduce flow stress and promote uniform plastic deformation. The specimens were subjected to multi-passes following Route BC, involving 90° rotation between passes to facilitate effective grain refinement through intersecting shear deformation.

Microstructural characterization was carried out using Optical Microscopy (OM), Scanning Electron Microscopy (SEM), and Energy Dispersive X-ray Spectroscopy (EDS) to observe grain refinement and elemental distribution. Electron Backscatter Diffraction (EBSD) was employed for quantitative analysis of grain size and crystallographic orientation. Mechanical properties were evaluated via hardness and tensile testing to correlate

**Type of presentation must be matched with an option you choosing on student upload system.*
***The abstract can be more than one page and must be approved by project advisor before upload.*

microstructural changes with strength development.

The results indicate that ECAP processing at elevated temperature significantly refines the microstructure and improves mechanical properties. Increasing ECAP passes led to enhanced hardness, demonstrating the effectiveness of ECAP as a viable technique for strengthening Aluminum–Magnesium–Silicon Alloy 6061 for advanced engineering applications.

**Type of presentation must be matched with an option you choosing on student upload system.*

***The abstract can be more than one page and must be approved by project advisor before upload.*

**Type of presentation must be matched with an option you choosing on student upload system.*

***The abstract can be more than one page and must be approved by project advisor before upload.*