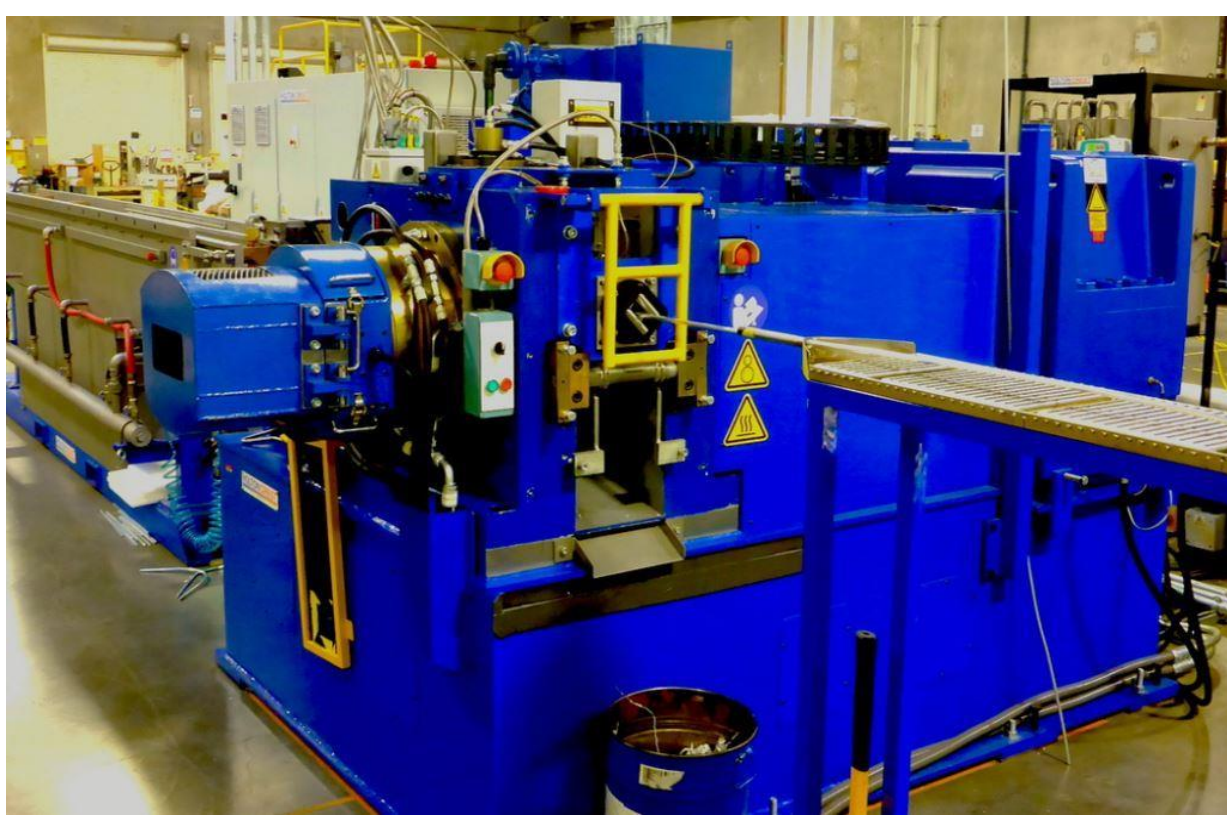


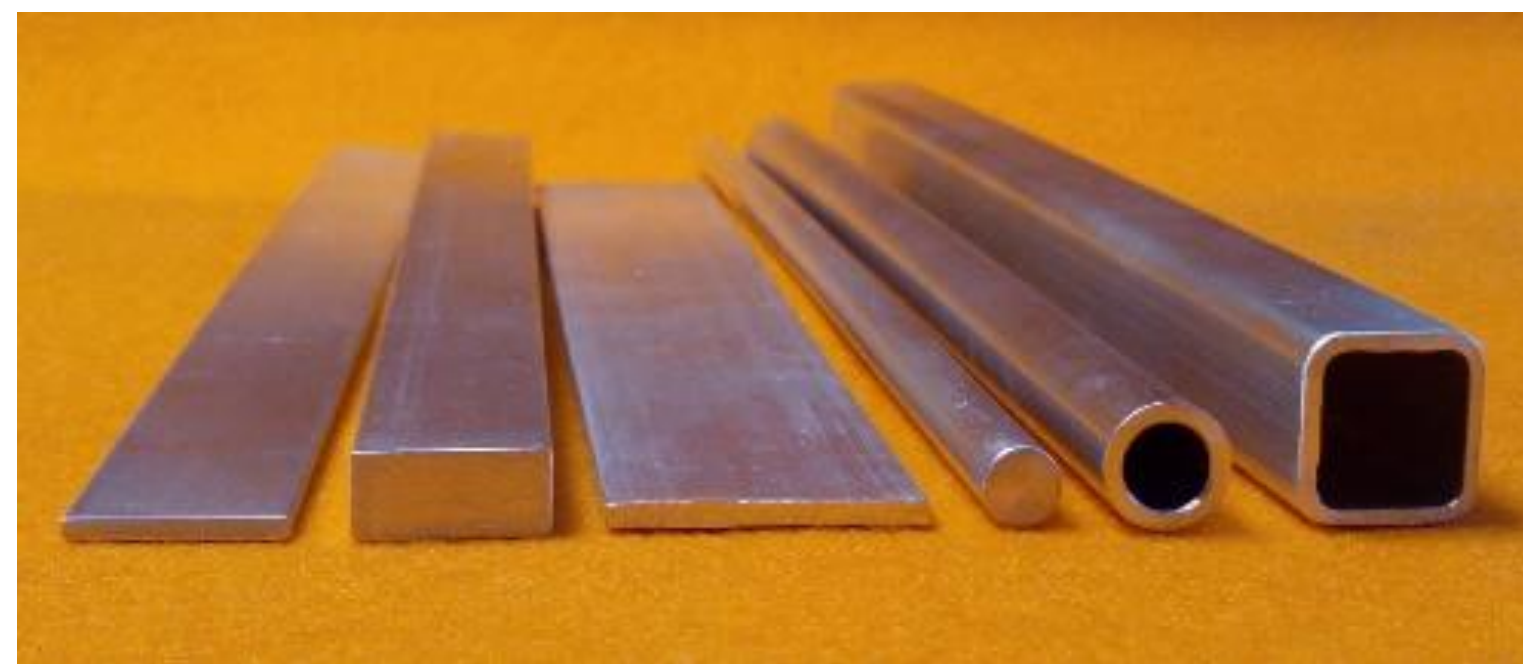
## Continuous Extrusion of Aluminum-Carbon Nanotube Composites

We have developed a continuous, scalable extrusion method to fabricate Aluminum-carbon nanotube (Al-CNT) composite wire, busbars, rods, and tubes. The addition of CNT increases the tensile strength, the heat- and creep-resistance compared to pure Aluminum and Aluminum alloys, while maintaining conductivity of about 60% IACS. Potential applications are electrical wires and components.

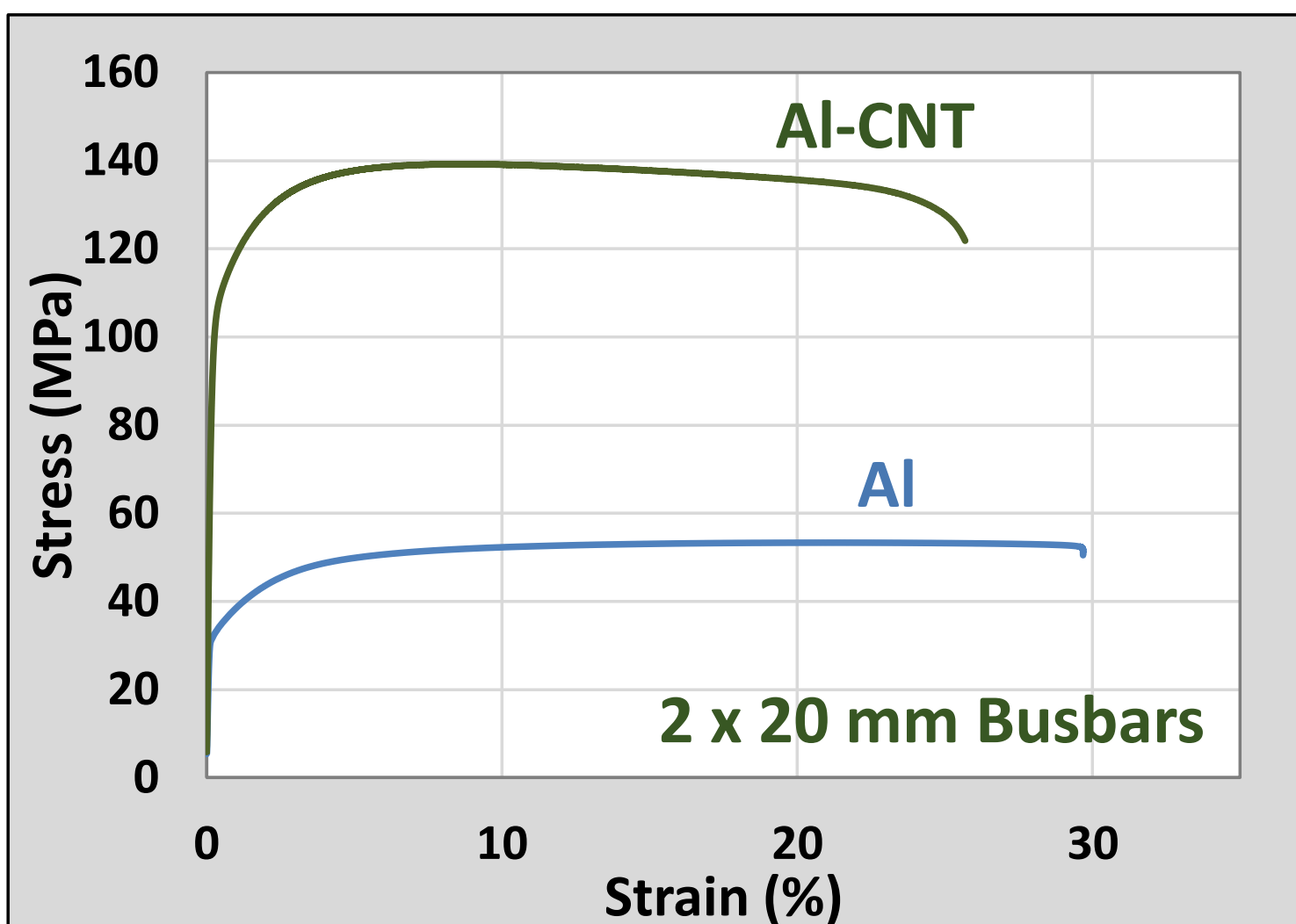
**Aluminum Extruder**



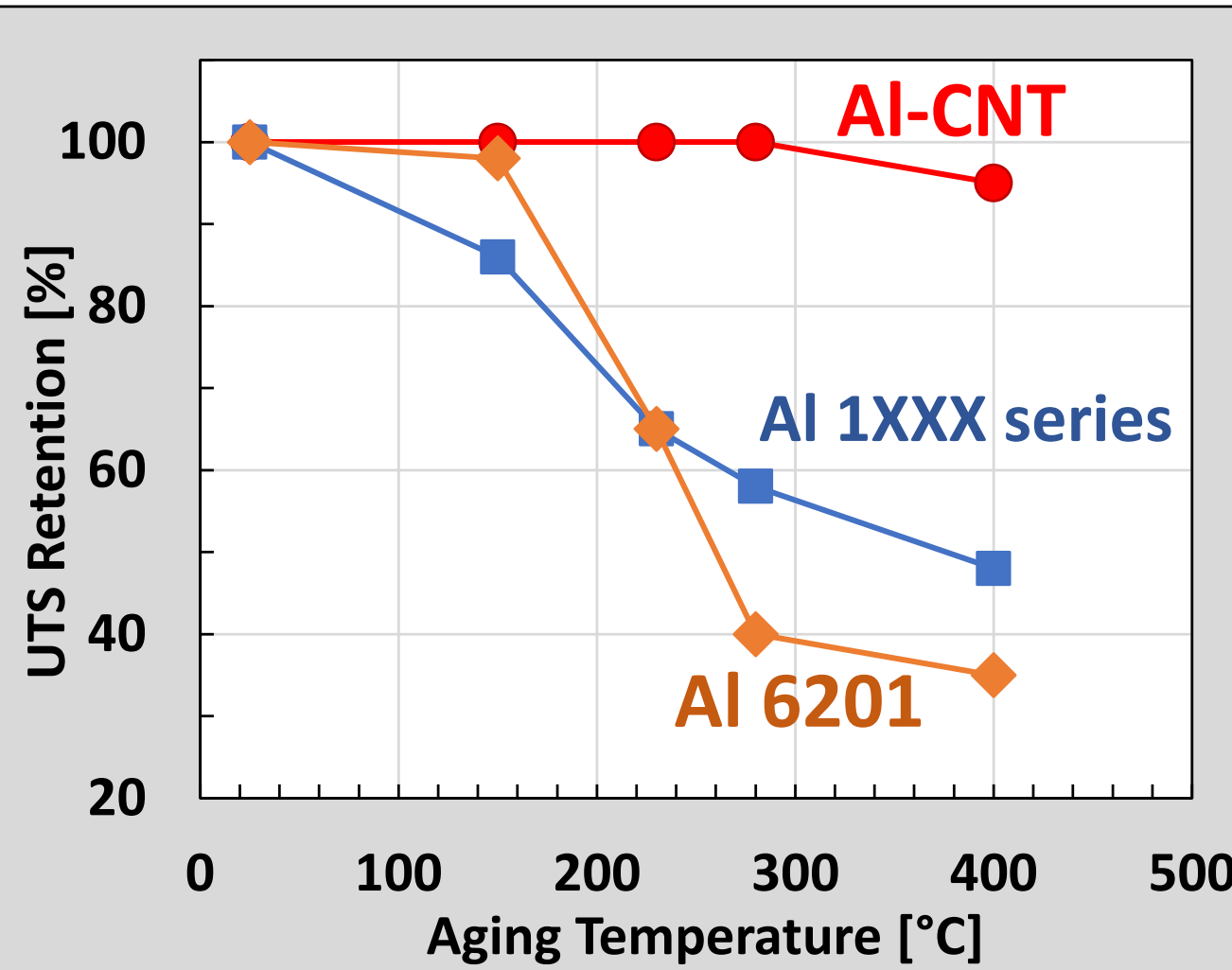
**Extruded Busbars, Rods, and Tubes**



**Improved Tensile Strength**

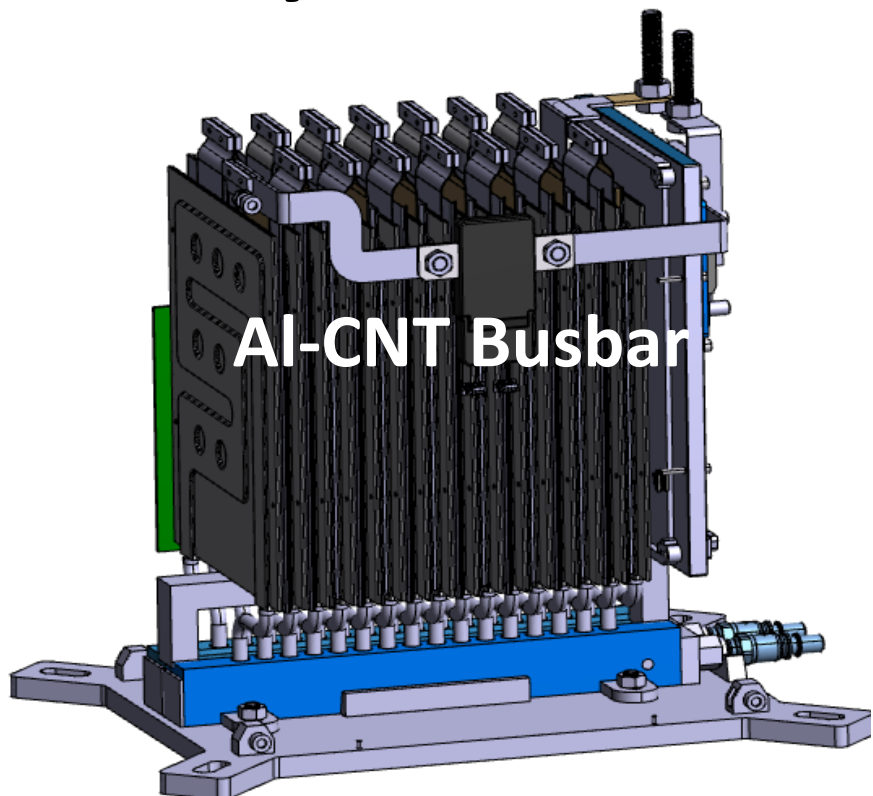


**Improved Heat-Resistance**



**>90% Mechanical Strength Retained after 1 hour Aging at 400°C**

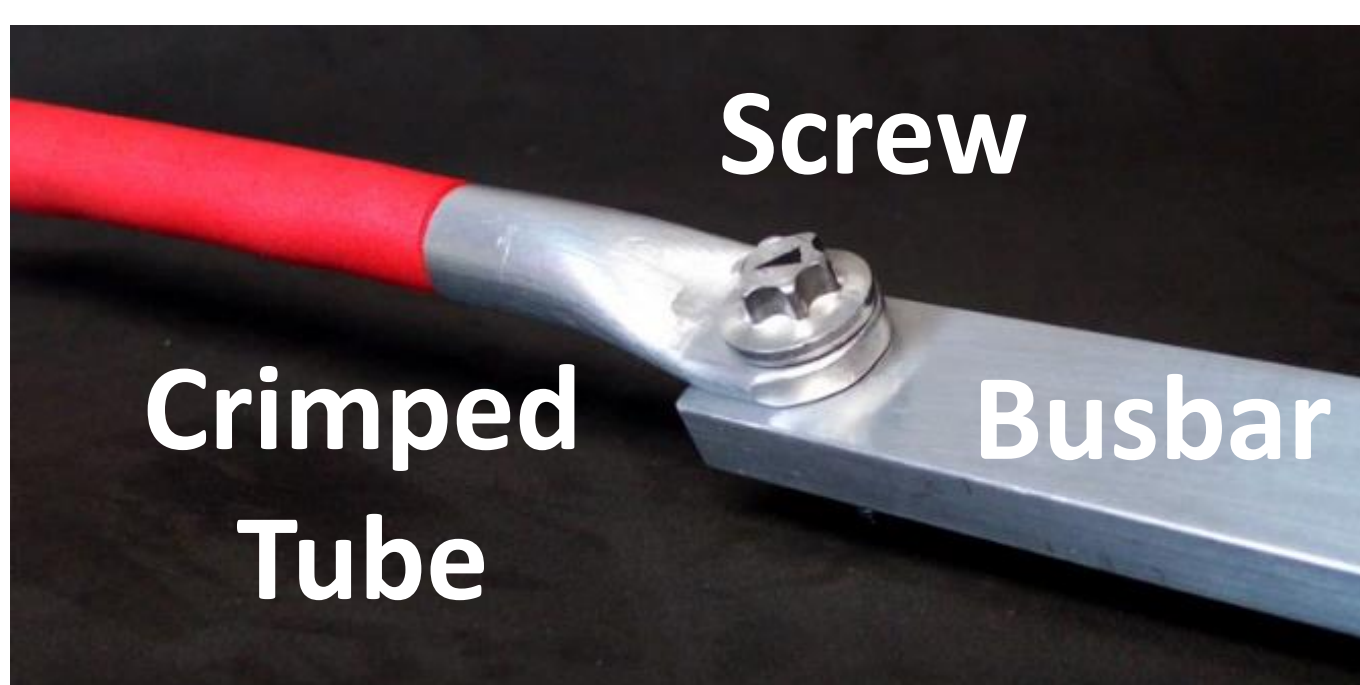
**Busbar Used in Battery Module**



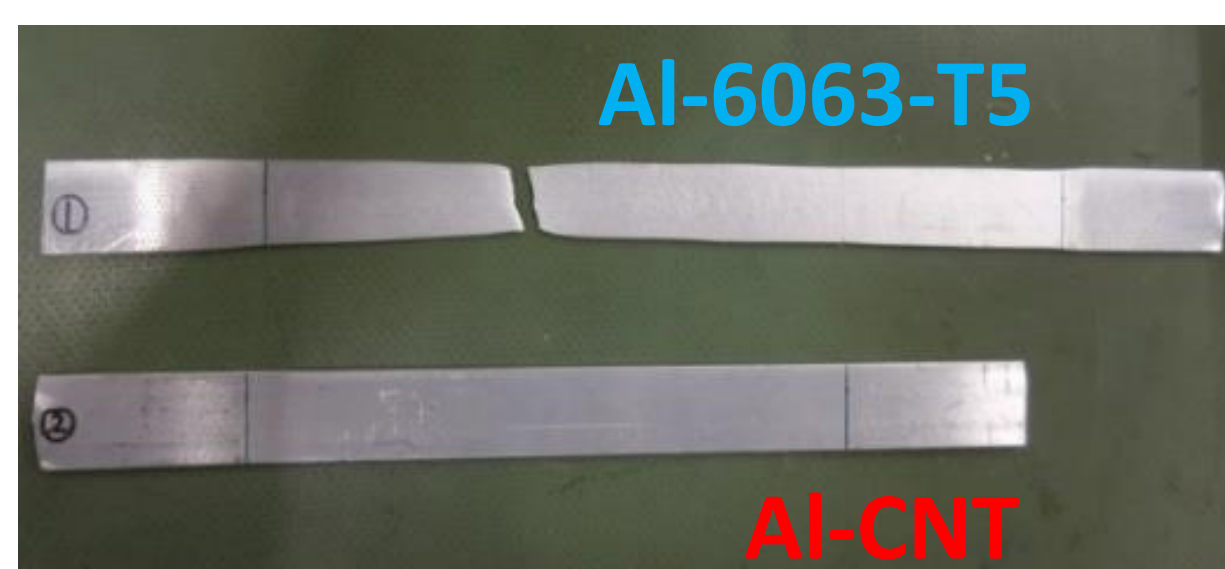
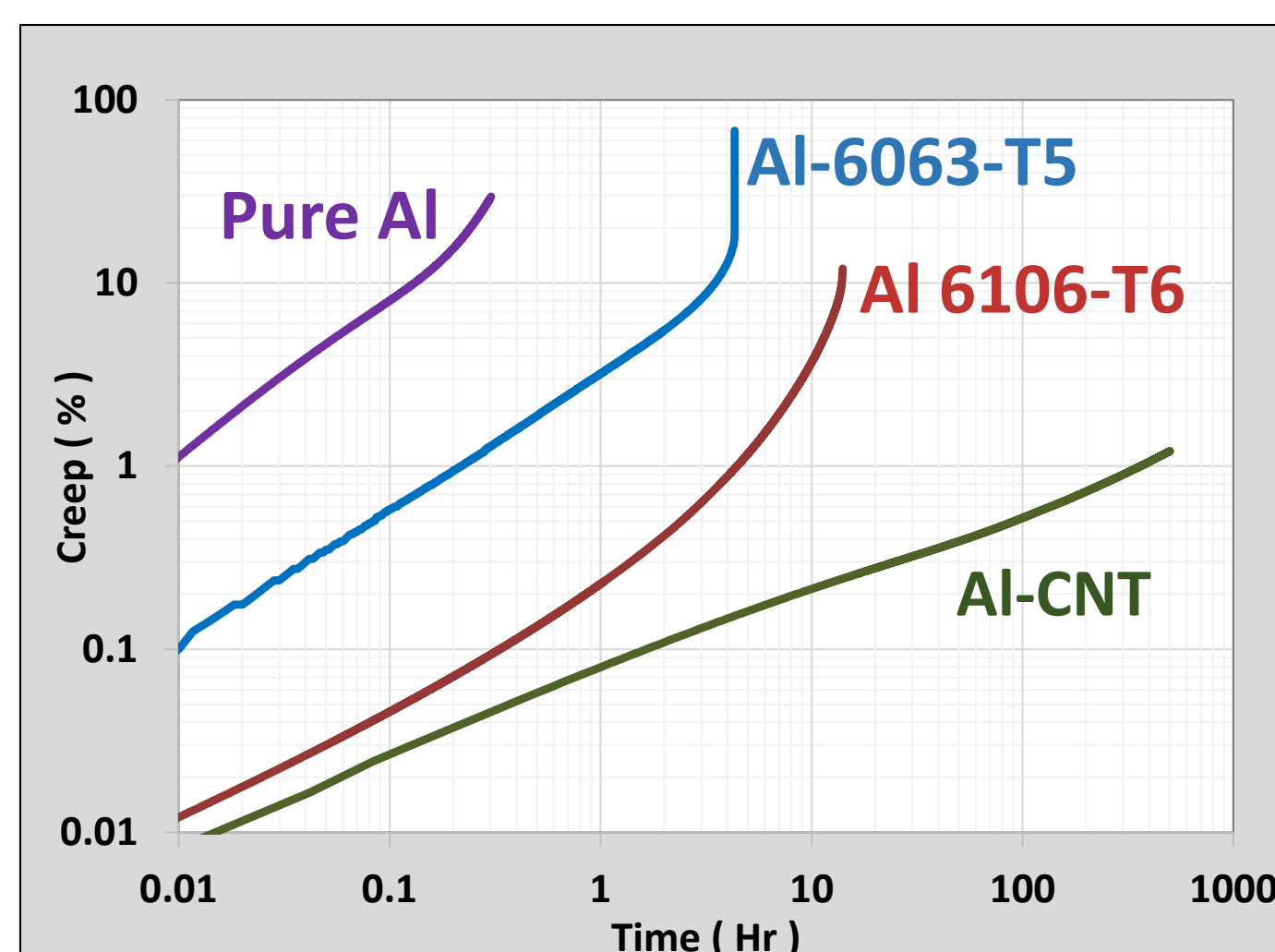
**Al-CNT Fastener**



**All Al-CNT Connection**



**Improved Creep-Resistance**



### HIGHLIGHTS

- Continuous and manufacturable Al-CNT extrusion process demonstrated
- Al-CNT wires, busbars, tubes, and rods have been demonstrated
- An all Al-CNT electric connection eliminates galvanic corrosion and thermal expansion mismatch
- Busbar patent applied for

### Benefits of Al-CNT Composites

- Tensile strength increased compared to Aluminum
- Creep and heat resistance improved compared to pure Aluminum and Aluminum alloys
- Aluminum conductivity of ~60% IACS