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Ultrasonic Welds between Brass Terminals and Aluminum Cables for Use in Electric/Hybrid Vehicles: An Electron Microscopy Investigation BRANDON HART, C. VIRGIL SOLOMON, Department of Mechanical & Industrial Engineering, Youngstown State University — The purpose of this project was to analyze two ultrasonic welds of aluminum cable to brass terminals which were supplied by a local company, where one weld sample was considered successful and the other was considered unsuccessful. The consideration of “successful” (sample 1) versus “unsuccessful” (sample 2) weld was determined by whether the weld passed the local company’s shear test. The goal of the analysis was to understand the cable/terminal surface conditions and ultrasonic weld microstructural and chemical characteristics of “successful” and “unsuccessful” samples. Light and scanning electron microscopy analysis of the aluminum wires forming the cable showed significant roughness on the surface of the sample 1 wires, while the sample 2 have much smoother wire surfaces. Extended voids at the welded aluminum/brass interface of sample 2 were observed by combined high resolution SEM/TEM investigations. TEM analysis showed specific patterns in both materials for the length of the sample: highly deformed material along the interface, and an amorphous layer between the two metals. It was determined that ultrasonic weld performance depends on the surface condition of the starting materials.

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