

Advances in Welding/Brazing of Lightweight Automotive Materials

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CanmetMATERIALS / CanmetMATÉRIAUX



On February 21, 2025, the CWB project progress review meeting took place at **Lincoln Electric** in Mississauga, Canada, focusing on weld-brazing technology for joining automotive components. Esteemed experts from Canadian research centers and industries, including **CWB**, **Lincoln Electric**, **International Zinc Association**, **Stelco**, **Metalleco**, **FuseRing Inc.**, **Aecon**, **Voestalpine**, **ASTM International**, **BWXT**, **CanmetMATERIALS**, **Dana Incorporated**, **Smarter Alloys**, **Huys and Rafail CAD & Engineering Inc.**, were invited to the meeting.

Presentations

Prof. Adrian Gerlich: CWB project: An Introduction to Partnerships and Initiatives

Xiaoye Zhao: Role of coating type and chemistry on the joint formation mechanism of the laser brazed steels.

Shadab Sarmast: Recent Advances in Weld-Brazing of Automotive Structure: Optimizing Process and Unveiling Failure Mechanisms

Jihui Yan: Electrospark Deposition of AlCrFeCoNi High-Entropy Alloy Coating on Medium Carbon Steel

Nick Xiao: Advancement in welding and joining in Metalleco

Andrew Embleton and Neel Agarwal: Laser Welding Techniques for Advanced High-Strength Steel Blanks

Cael Johnston: Optimization of failure modes in Resistance spot welding of 3rd generation Advanced high strength steel

Key Deliverables

- ❖ Recent investigation on coating effects in laser brazing of automotive steels
- ❖ Critical factors on the mechanical properties of weld-brazed joints: From macro-scale to fundamental nano-scale aspects
- ❖ Advancements in high-entropy alloy coatings using ESD Technique
- ❖ Intelligent welding production line in Metalleco Inc.
- ❖ Recent developments in laser welding of tailored weld blanks
- ❖ Optimization of the resistance spot welding process
- ❖ Tour of advanced equipment at the ARC center, Lincoln Electric
- ❖ Visit an aluminum wire welding consumables manufacturing Plant
- ❖ Presentation on recent advances in automation at Lincoln Electric

Recent Publications

[1] Investigation of the Critical Factors Influencing Mechanical Properties and Failure Behavior in Weld-Brazed ZnAlMg Coated Steel. <https://doi.org/10.1007/s11661-024-07671-7>

[2] Joint Interface Characteristics and Phase Transformations in Laser Brazed Steel.

<https://doi.org/10.1007/s11661-025-07708-5>

[3] On the nature of nano twin-induced shear band formation in a dispersion strengthened copper alloy under micro-mechanical loading. <https://www.nature.com/articles/s41598-024-74019-x>

[4] Joint formation mechanism and mechanical properties of laser brazed Zn coated steel

under different defocusing conditions. <https://doi.org/10.1016/j.jmrt.2024.10.055>

[5] The influence of joint geometry on the interfacial bonding in laser-brazed flare joints of

automotive steels. <https://doi.org/10.1016/j.mfglet.2024.07.002>

[6] In-situ CrFeCoNi medium entropy alloying coating via electrospark powder deposition.

<https://doi.org/10.1177/026708442412829>

Sponsors and attendees

Vladimir Yasnogorodski (Lincoln Electric) | Emma Pugsley (BWXT)
Cristian Zanfir (CWB) | Ana Paula Domingos Cardoso (IZA)
Terry Boucher (CWB) | Emmerson Peacock (BWXT)
Jason Elliott (CWB) | Tirdad Niknejad (CanmetMATERIALS)
Mark Kozdras (NRC) | Kusay Rafo (Rafail CAD & Engineering)
Christopher Martin-Root (Stelco) | Norman Zhou (UWaterloo)
Kevin Chan (Huys) | Adrian Gerlich (UWaterloo)
Nick Xiao (Metalleco) | Michael Benoit (UWaterloo)
Josh Chance (Metalleco) | Peng Peng (UWaterloo)
Paul Cheng (FuseRing) | Shadab Sarmast (UWaterloo)
Jake Warriner (Aecon) | Xiaoye Zhao (UWaterloo)
Jay Patel (Aecon) | Jihui Yan (UWaterloo)
Ali Keshavarz (Voestalpine) | Andrew Embleton (UWaterloo)
Richard Martens (Voestalpine) | Neel Sanjay Agarwal (UWaterloo)
Pablo Enrique (ASTM International) | Cael Johnston (UWaterloo)
Hadi Razmpoosh (Dana Incorporated) | Hanwen Yang (UWaterloo)
Amirali Shamsolhodaei (Smarter Alloys) |
Ali Ghathei |

Next step

The principal investigators and sponsors have decided to schedule a similar session in approximately six months. The date and location of the next meeting will be communicated soon.

Looking forward to seeing you soon...