

ORIGINAL RESEARCH ARTICLE

A biomimetic machine learning approach for predicting the mechanical properties of additive friction stir deposited aluminum alloy-based walled structures

Supplementary File**Supplementary Video**

Video S1. The video represents the modeling of additive friction stir deposition process using the element activation and deactivation method

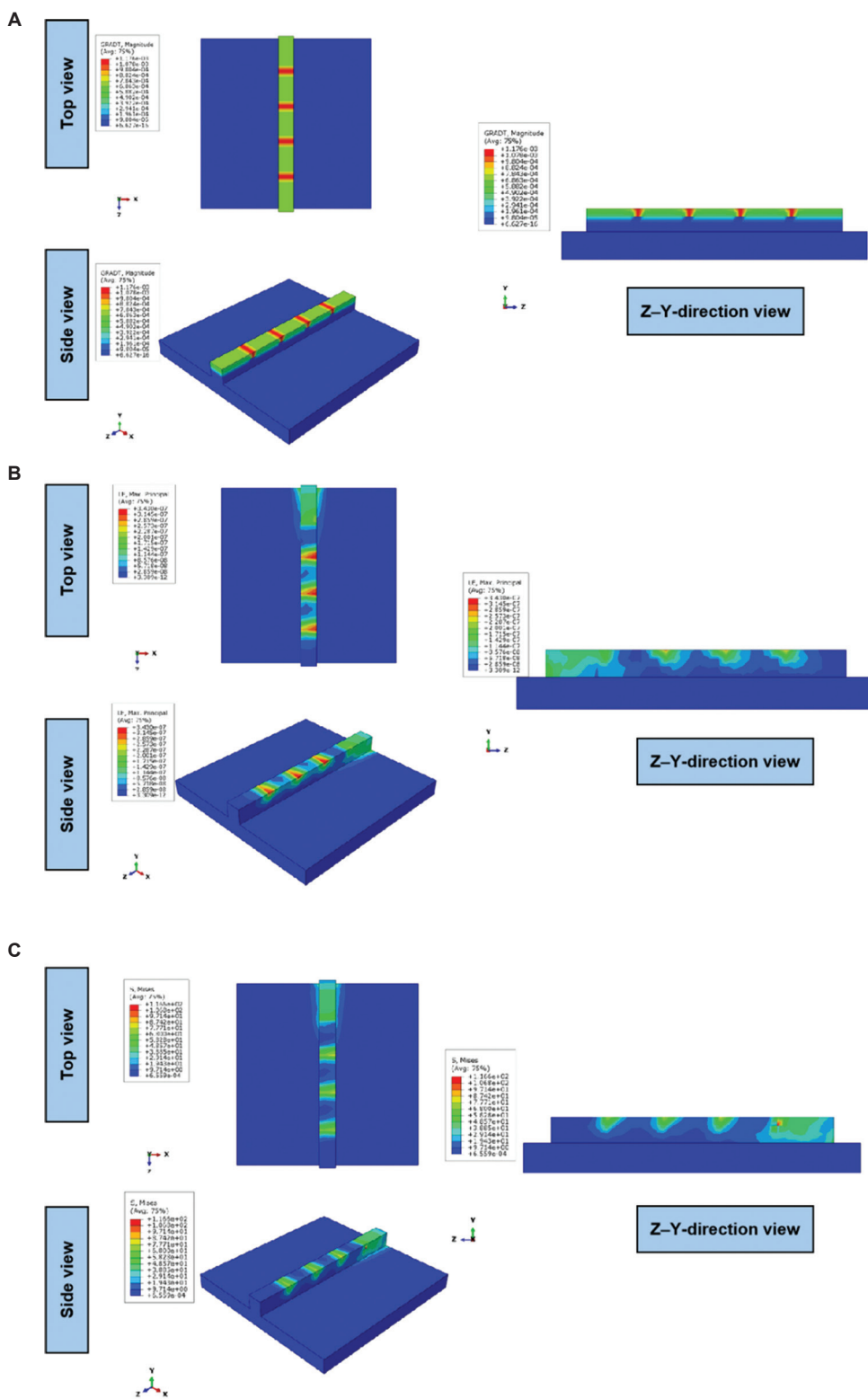


Figure S1. Visualizations for additive friction stir deposited (AFSD) AA2024 walled structures: (A) temperature gradients (GRADT) within the AA2024 structure, (B) logarithmic strain (LE) distribution, and (C) von Mises stress distribution. These plots illustrate the evolution of thermal and mechanical properties during the AFSD process for the AA2024 alloy.

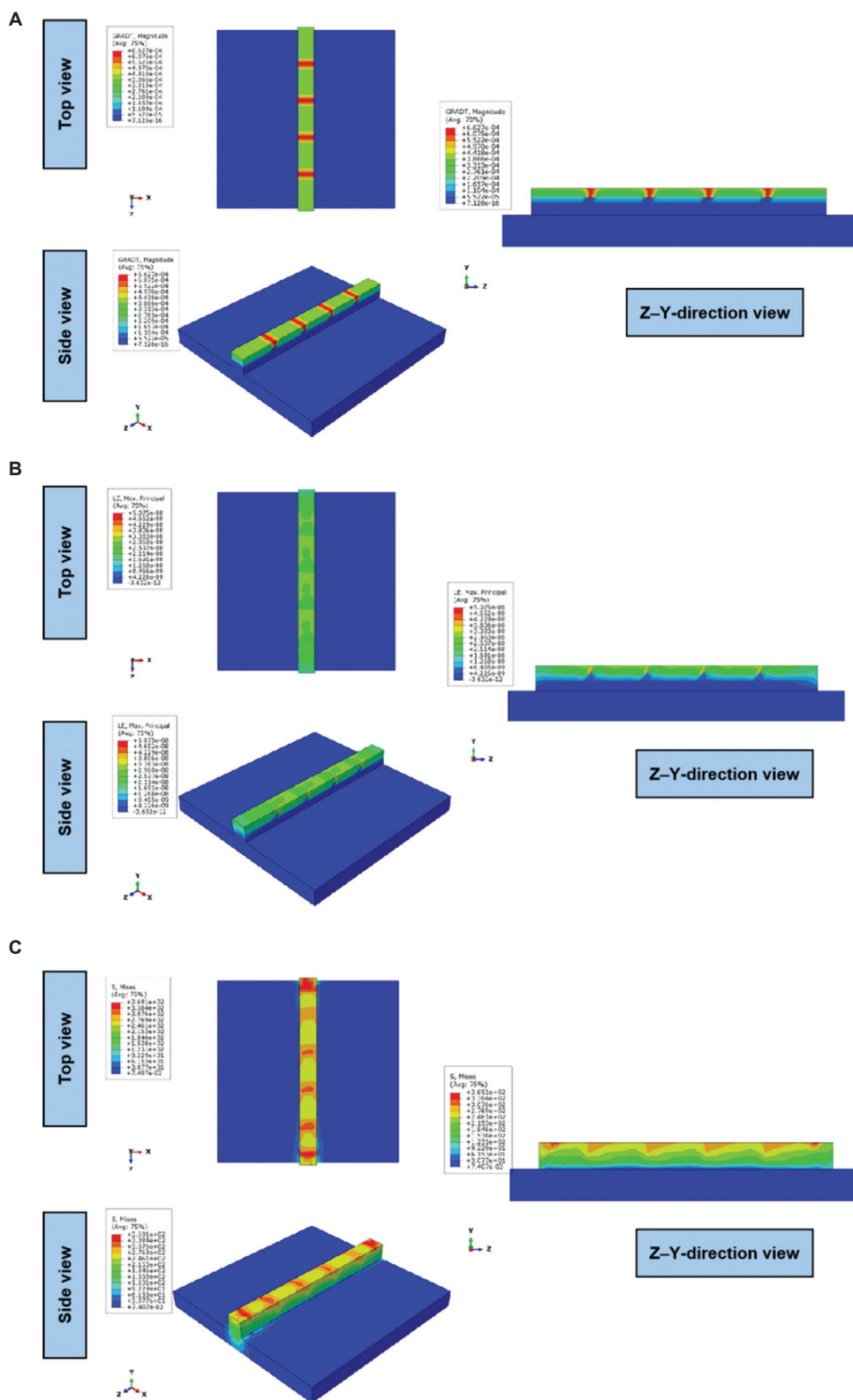


Figure S2. Visualizations for additive friction stir deposited (AFSD) AA5086 walled structures: (A) temperature gradients (GRADT) in AA5086, (B) logarithmic strain (LE) distribution, and (C) von Mises stress distribution. These plots illustrate the evolution of thermal and mechanical properties during the AFSD process for the AA5086 alloy.

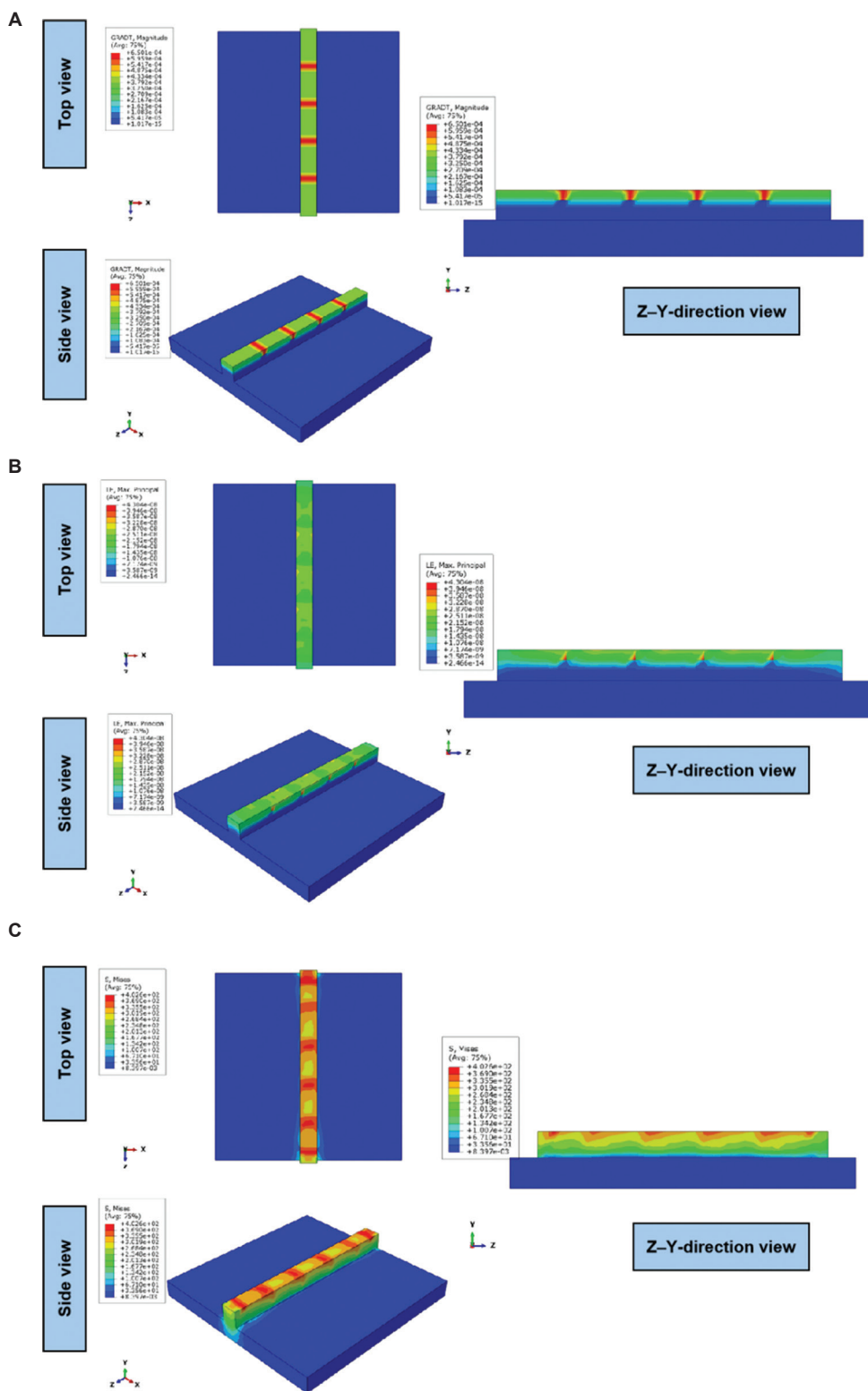


Figure S3. Visualizations for additive friction stir deposited (AFSD) AA6061 walled structures: (A) temperature gradients (GRADT) within the AA6061 structure, (B) logarithmic strain (LE) distribution, and (C) von Mises stress distribution. These plots illustrate the evolution of thermal and mechanical properties during the AFSD process for the AA6061 alloy.

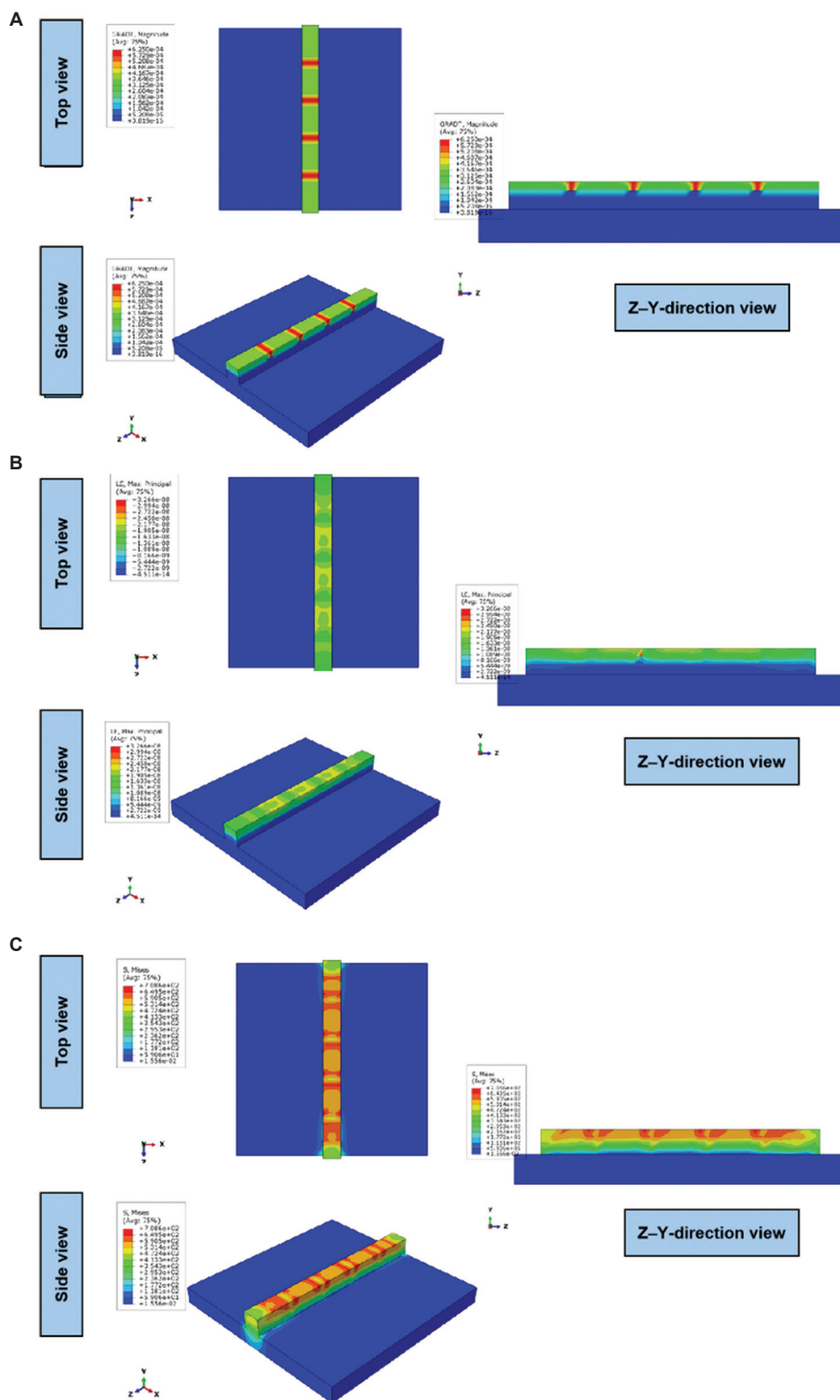


Figure S4. Visualizations for additive friction stir deposited (AFSD) AA7075 walled structures: (A) temperature gradients (GRADT) within the AA7075 structure, (B) logarithmic strain (LE) distribution, and (C) von Mises stress distribution. These plots illustrate the evolution of thermal and mechanical properties during the AFSD process for the AA7075 alloy.

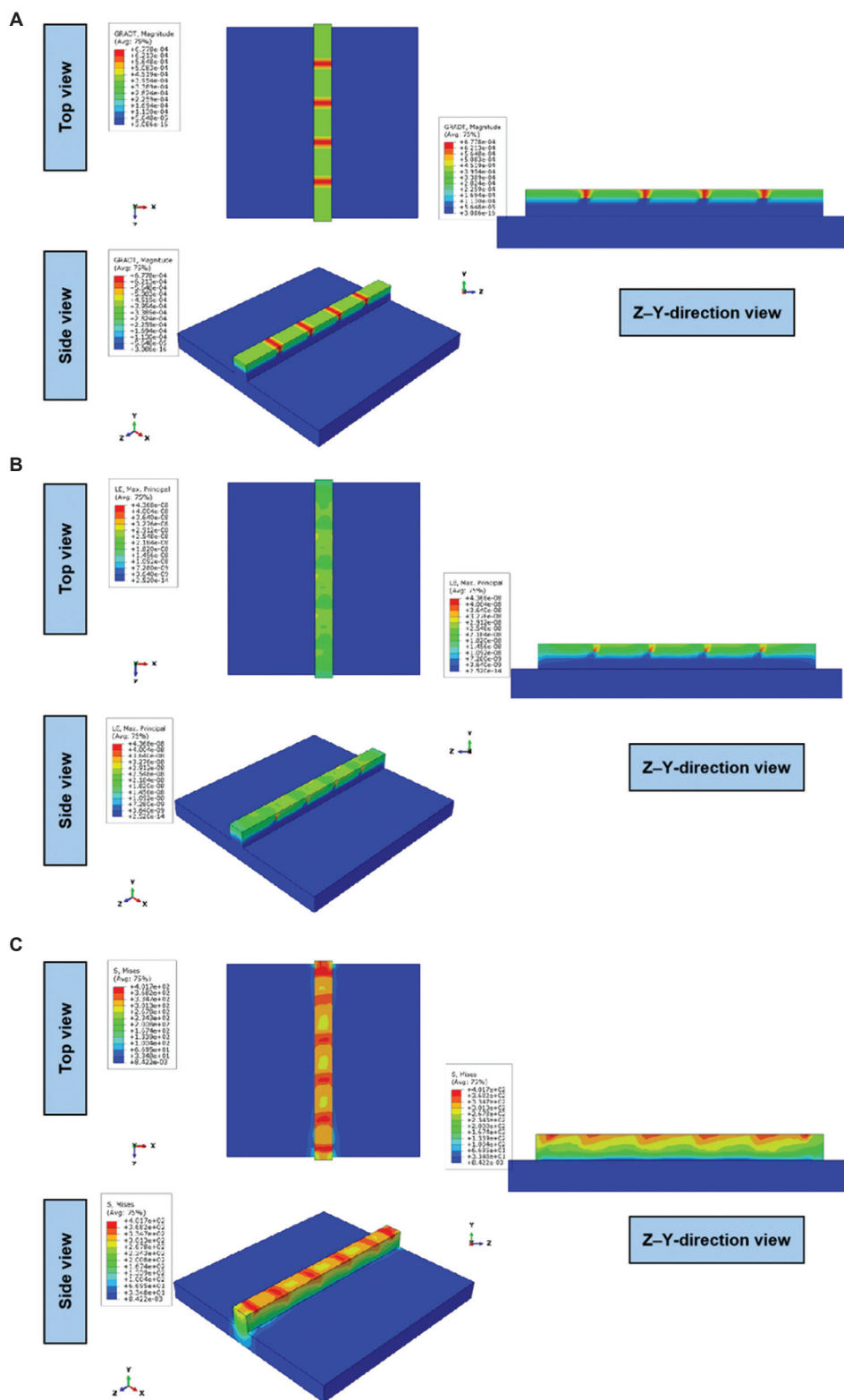


Figure S5. Visualizations for additive friction stir deposited (AFSD) AA5083 walled structures: (A) temperature gradients (GRADT) within the AA5083 structure, (B) logarithmic strain (LE) distribution, and (C) von Mises stress distribution. These plots illustrate the evolution of thermal and mechanical properties during the AFSD process for the AA5083 alloy.