

**Battelle Number(s):**

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Patent(s) Issued

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# Friction Stir Scribe Technology Enables Dissimilar Material Joining

## SUMMARY



Solid state joining processes like friction stir welding enable welding of many materials otherwise considered unweldable. While friction-based approaches have been demonstrated to produce joints between dissimilar metals, the metallurgical immiscibility of certain combinations greatly complicates the joining of very dissimilar materials due to drastic variations in the melting temperatures of each component. A process developed by researchers at Pacific Northwest National Laboratory called Friction Stir Scribe Technology overcomes the issues created by chemical incompatibility and melting temperature variations between dissimilar material combinations. This process enables the joining of dissimilar materials in a lap configuration where the materials are bonded both chemically and mechanically simultaneously to both enable joining and enhance weld properties.

The process combines localized, controlled extrusion of the lower melting temperature material with focused machining of the higher melting temperature material at the interface of the two materials. This combined action works to create a mechanically interlocked joint at a temperature below the melting point of the lower melting temperature material; thus, maintaining the solid state nature of the process and eliminating complications with chemical incompatibility caused by traditional melt-solidification weld processes. This enables the welding of very different metals, but also allows for the welding of different materials such as polymers to metals or composites.

## ADVANTAGES

- \* Overcomes the issues created by chemical incompatibility and melting temperature variations between dissimilar material combinations
- \* Generates a lap weld that binds the dissimilar materials both chemically and mechanically to achieve enhanced joint strength
- \* Allows for the welding of very different metals and materials such as polymers to metals or composites
- \* Lap welds strength is enhanced by filled interlocking features

### Patents & Intellectual Property

» Patent #: US 8,434,661 B21

### Technology Portfolio(s)

» Manufacturing

### Potential Industry Applications

» Aerospace & Defense

» Automotive & Transportation

» Manufacturing & Warehousing

» Oil & Gas

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