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Surface Molecular Film to Combat Sinuous Flow for Cutting Metal

Track Code: 2019-CHAN-68634

Categories:
- Materials and Manufacturing
- Micro & Nanotechnologies

Keywords:
- Alloys
- Annealed Metals
- Chip Formation
- Chips
- Cutting Metal
- Ductile to Brittle Transition
- Energy Systems
- Forces
- Machining
- Metallurgy
- Metals
- Molecular Film
- SAM
- Sinuous Flow
- Surface Finish
- Surface Quality

Researchers at Purdue University have identified molecular film coatings for work pieces to avoid poor chip formations, resist undesired external forces, and ensure ideal surface finishes. Soft and strain-hardening metals are traditionally cut in the process of materials manufacturing, but often undergo undesired shape changes. Obstructive mechanochemical effects in these "gummy" materials are preventable through self-assembled monolayer films (SAM). In materials that transition from ductile to brittle behavior readily during machining, underlying sinuous flow can be altered or eliminated altogether. Unlike inks or glues, SAMs that are applied to a metal before cutting stop fractures and other unintended local changes. When compared with current cutting techniques, SAM applications show improvement of chip thickness by a factor of three and lowers forces from machining of 600N down to no more than 250N. This technology can be implemented in automotive, aeronautical, and biomedical applications for a better quality product.

Advantages:

-Better surface finish
-Smaller chip size
-Reduced shape change
-Resistance to brittle behavior
-Fewer local changes

Potential Applications:
-Automotive
-Aerospace
-Biomedical

People:

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Intellectual Property:

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