A. Acronyms and Abbreviations

A

A2MAC1 - (Supplier of Database)
ABAQUS - a commercial finite element code
ACC - Automotive Composites Consortium
ACCU - ACC Underbody Project
AHSS - Advanced high-strength steels
AISI - American Iron and Steel Institute
Al - aluminum
ALE - Arbitrary Lagrangian-Eulerian
AMD - Automotive Metals Division
A/SP - Auto-Steel Partnership
ASAP - Automated Sample Preparation System
ASP - Auto Steel Partnership
ASTM - American Society for Testing of Materials
AT - Axial-Torsional
ATC - Analytical Target Cascading
AUST, SS - austenitic stainless steel
AWS - American Welding Society

B

BBC - body centered cubic
BCJ - Bammann-Chiesa-Johnson
BET - Brunauer, Emmett, and Teller
BFI - Body-Frame-Integral (e.g. ‘unibody’)
BH - bake-hardenable
BIW - body-in-white
BN - used to designate a stir tool made from polycrystalline boron nitride. Numbers following BN, such as BN46, BN77, etc., are codes referring to the machining drawings that specify the tool shapes and dimensions.

BOF - Body on Frame

### C

- C - Carbon
- CA - Cellular Automaton
- CAE - Computer-aided engineering
- CAD - Computer Aided Design
- CALPHAD - Calculated Phase Diagram
- CAVS - Center for Advanced Vehicular Systems
- CCT - continuous cooling transformation
- CDC - channel die compression
- CF - carbon fiber
- CMH - Composite Materials Handbook
- CNC - computer numerical control
- Co - Cobalt
- CO₂ - Carbon dioxide
- CP - complex-phase
- CP - crystal plasticity
- CPMT - Center for Powder Metallurgy Technology
- Cr - chromium
- CRADA - Cooperative Research and Development Agreement

### D

- D12, D13, D23 - components of rate of deformation tensor
- db - Dry basis (adjusted for moisture content)
- DC - Direct Current
- DD - discrete dislocation
- DICTRA - DIffusion-Controlled TRAnsformations in multicomponent systems (software package).
- OEMs - original equipment manufacturers
- DOE - Department of Energy
DoE - Design of experiment
DP - dual-phase
DP590 - dual phase 780 MPa
DP780 - dual phase 780 MPa
DQSK - draw-quality semi-killed
DRIFT - Direct Re-Inforcement Fabrication Technology
DRX - Dynamic Recrystallization
DSC - differential scanning calorimetry

E
EAM - embedded atom method
EBSD - Electron back-scatter diffraction
EDS - Energy dispersive microanalysis
EERE - Energy Efficiency and Renewable Energy
EHF - Electrohydraulic Forming
EHSSA - enhanced hierarchical statistical sensitivity analysis
EMF - Electromagnetic Forming
ER - extrusion ratio
ESPEI - Extensible Phase Equilibrium (software package)
ETA - (Supplier) Engineering Technology Associates

F
FBJ - Friction bit joining
FCC - face centered cubic
Fe - iron
FE - Finite element
FEA - Finite Element Analysis
FEM - Finite Element Modeling
FGPC - Future Generation Passenger Compartment
FLC - forming limit curve
FLCA - Front Lower Control Arm
FLD - Forming Limit Diagram
FMVSS - Federal Motor Vehicle Safety Standards
FRPMC - Fiber reinforced polymer matrix composites
FSSW - Friction stir spot welding
FOM - Figure of merit
FY - fiscal year

G
GA - galvannealed
GDIS - Great Designs in Steel
Gen - Generation
GM - General Motors Company
GMAW - Gas metal arc welding
GOS - grain orientation spread
GPa - Giga-Pascal
GSSI - global statistical sensitivity index

H
HAZ - Heat affected zone
HCP - Hexagonal Close Packed
HPDC - High Pressure Die Cast
HSB - hot-stamp boron
HSBS - hot-stamped boron steel(s)
HSLA - High-Strength Low Alloy
HSS - High Strength Steels
HSSA - hierarchical statistical sensitivity analysis
HyperXtrude - a commercial finite element code
Hz - Hertz

I
ICME - Integrated Computational Materials Engineering
ID - identification
IF - interstitial-free
IIHS - Insurance Institute for Highway Safety
IPT - in-plane transverse
IR - Infrared
ISV - Internal State Variable

**J**
JSSC - Joining Strategy Steering Committee

**K**
kg - Kilogram (unit)

**L**
LAMMPS - a molecular dynamics code
LANL - Los Alamos National Laboratory
lb - Pound (unit)
LCA - Life Cycle Analysis
LCCF - Low Cost Carbon Fiber
LCI - Life Cycle Inventory
LDH - limit dome height
LENS - Laser Engineered Net Shaping
L-IP - lightweight austenitic steels with induced plasticity
LM - Lightweighting Materials

**M**
m - Meter (unit)
µm - Micron (unit)
µs - microseconds
m²g - square meters per gram
MA - Methyl acrylate
MAP - Microwave-assisted plasma
MBC – Main Bearing Cap
MC - Monte Carlo
MCA - Material Constitutive Analyzer
MCA - Material Constitutive Analyzer
MCS - Monte Carlo time step
MD - molecular dynamics
MEARS - Mass Efficient Architecture for Roof Strength
MEL - Magnesium Elektron Inc.
MFE - Magnesium Front End
MFEDD - Magnesium Front-End Design and Development Project
MFERD – Magnesium Front End Research and Development
Mg - Magnesium
min - minute (unit)
mm - millimeter
MMV - Multi-Material Vehicle Program
Mn - Manganese
Mo - molybdenum
MPa - mega-Pascal
MPIF - Metal Powder Industries Federation
MPP - Mesophase pitch
MPS - material point simulator
MS - Martensitic Steels
MS - Master of Science
MSF - Multi-stage fatigue (model)
MSST - Mississippi State University

N
N - nitrogen
Nb - Niobium
NCAP - New Car Assessment Program
NDA - Non-disclosure Agreement
NDE - Nondestructive Evaluation
NDI - Nondestructive Inspection
Ni - Nickel
NIST - National Institute of Standards
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>nm</td>
<td>nanometer</td>
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<tr>
<td>NPSS</td>
<td>nano precipitate strengthened steel</td>
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<td>NSF</td>
<td>National Science Foundation</td>
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<tr>
<td>NVH</td>
<td>noise, vibration, and harshness</td>
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<tr>
<td>O</td>
<td>oxygen</td>
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<tr>
<td>ODB</td>
<td>Offset Deformable Barrier</td>
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<tr>
<td>OEMs</td>
<td>original equipment manufacturers</td>
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<tr>
<td>OM</td>
<td>Optical Microscope</td>
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<tr>
<td>ORNL</td>
<td>Oak Ridge National Laboratory</td>
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<tr>
<td>P</td>
<td>Phosphorus</td>
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<tr>
<td>P4</td>
<td>Programmable Powdered Preform Process</td>
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<tr>
<td>PAN</td>
<td>Polyacrylonitrile</td>
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<tr>
<td>PCBN</td>
<td>polycrystalline boron nitride</td>
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<tr>
<td>PDAS</td>
<td>Primary Dendrite Arm Spacing</td>
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<tr>
<td>PDF</td>
<td>probability distribution function</td>
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<tr>
<td>PE</td>
<td>Polyethylene</td>
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<tr>
<td>PEO</td>
<td>Polyethylene oxide</td>
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<tr>
<td>PET</td>
<td>Polyethylene terephthalate</td>
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<tr>
<td>PFA</td>
<td>Progressive Failure Analysis</td>
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<td>PFF</td>
<td>Precision Flow Form</td>
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<tr>
<td>PI</td>
<td>Principal Investigators</td>
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<tr>
<td>PM</td>
<td>Powder Metal / Powder Metallurgy</td>
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<tr>
<td>PMC</td>
<td>Polymer matrix composite</td>
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<tr>
<td>PNNL</td>
<td>Pacific Northwest National Laboratory</td>
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<tr>
<td>PPF</td>
<td>Pulse Pressure Forming</td>
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<tr>
<td>ppm</td>
<td>parts per million</td>
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</tbody>
</table>


R

- Stress ratio defined as minimum stress/maximum stress in cyclic fatigue testing
- R&D - research and development
- RD&D - Research, development, and demonstration
- RF - radio frequency
- RMP - Repository of Material Properties
- ROI - Return on investment
- ROM - rough-order-of-magnitude
- ROS - reactive oxidative species
- RPM or rpm - revolutions per minute
- RSTO - robust shape and topology optimization
- RSW - resistance spot welding

S

- SAMPE - Society for the Advancement of Material and Process Engineering
- SANS - Small angle neutron scattering
- SBIR - Small Business Innovative Research
- SDAS - Secondary Dendrite Arm Spacing
- SEA - Specific Energy Absorption
- SEL - Solvent-extracted lignin
- SEM - Scanning electron microscope
- SETAC - The Society of Environmental Toxicology and Chemistry
- Si - Silicon
- SIMS - Secondary Ion Mass Spectrometry
- SMC - Sheet molding compound

SN - used to designate a stir tool made from silicon nitride. Numbers following SN, such as SN77 or SN97, are codes referring to the machining drawings that specify the tool shapes and dimensions.

- SOW - Statement of Work
- SPR - Self-pierce riveting
- SQS - Special Quasirandom Structures
- SRIM - structural reaction injection molding
- SSA - statistical sensitivity analysis
SUV - Sport Utility Vehicle
SVDC - Super Vacuum Die Casting
SVE - statistical volume element
SWE - spot weld element

T
TCM - Technical Cost Modeling
TEM - Transmission electron microscope
TGA - Thermogravimetric Analysis
Ti - Titanium
TMAC - Test Machine for Automotive Crashworthiness
TMS - The Minerals, Metals, and Materials Society
TMP - thermo-mechanical processing
TRIP - transformation-induced plasticity
TS - Tensile Strength
TT - through thickness
TWIP - Twinning Induced Plasticity steel

U
UCF - University of Central Florida
UHSS - Ultra High Strength Steel
UHV - Ultra-High Vacuum
ULSAB-AVC - Ultralight Steel Auto Body-Advanced Vehicle Concept
UMAT - user material routine
USAMP - United States Automotive Materials Partnership
USCAR - United States Council for Automotive Research
UT - University of Tennessee (Knoxville, TN)
UV - Ultraviolet light
UVa – The University of Virginia
UW - Ultrasonic welding/joining
| V | V - vanadium  
|   | VA - Vinyl acetate  
|   | VPSC - Visco-plastic self-consistent (model for deformation) |
| W | WDS - Wavelength dispersive microanalysis  
|   | Wt (and wt%) - Weight (and % by weight) |
| X | XPS - X-ray Photoelectron Spectroscopy  
|   | XRCT - X-Ray Computed Tomography  
|   | XRD - x-ray diffraction |
| Y | YS - Yield Strength |
| Z | Zn - Zinc |
| Numeric | 2-T - two-thickness  
|   | 3D - Three dimensional |