# ALM 2011 Acronyms and Abbreviations

| | |
|---|---|
| °C | Celsius |
| µm | micrometer (micron) |
| 1D | one dimensional |
| 2D | two dimensional |
| 3D | three dimensional |
| 3G | third generation |

## A

| | |
|---|---|
| ACC | Automotive Composites Consortium |
| AFM | atomic force microscopy |
| AHEV | Advanced Hybrid Electric Vehicles |
| AHSS | advanced high-strength steel |
| Al | aluminum |
| AMD | Automotive Metals Division (USAMP) |
| AMI | Autodesk Moldflow Insight |
| APGE | Arizona Proving Ground Equivalent |
| Ar | Argon |
| AR | as received |
| ARD-RSC | anisotropic rotary diffusion–reduced strain closure |
| ASCM | Automotive System Cost Model |
| A/SP | Auto/Steel Partnership |
| ASTM | American Society for Testing and Materials |
| AWS | American Welding Society |

## B

| | |
|---|---|
| BC | boundary conditions |
| BCJ | Bammann-Chiesa-Johnson |
| BH | bake hardenable |
| BIW | body-in-white |
| bTBI | blast related Traumatic Brain Injury |
| BU | Boston University |

## C

| | |
|---|---|
| C | carbon |
| CAD | computer aided design |
| CAE | computer aided engineering |
| CAFE | Corporate Average Fuel Economy |
| CALPHAD | CALculated PHAse Diagrams |
| CAVS | Center for Advanced Vehicular Systems (MSST) |
| Ce | Cerium |
| CeCC | cerium based conversion coating |
| CF | carbon fiber |
| CFSL | carbon fiber semi-production line |
| CFRP | carbon fiber reinforced polymer |
| CFTF | Carbon Fiber Technology Facility |
| CMS | computational materials science |
| COV | coefficient of variation |
| CSUV | car-based SUV |
| CT | computed tomography |
| CTO | Chief Technology Officer |
| Cu | Copper |
| CUV | crossover utility vehicle |
| CVD | chemical vapor deposition |
| CY | calendar year |

## D

| | |
|---|---|
| DBF | draw-bend fracture |
| DBS | draw-bend springback |
| DDQ | deep drawing quality |
| demo | demonstration |
| DFT | discrete Fourier transform |
| DFT | density functional theory |
| DIC | digital image correlation |
| DICM | digital image correlation method |

| | |
|---|---|
| DMG | (coupled) elasto-viscoplastic-damage (model, MSST) |
| DOE | U.S. Department of Energy |
| DP | dual phase (steel) |
| DSC | differential scanning calorimetry |

## E

| | |
|---|---|
| ED | extruded direction |
| EDAX | energy dispersive x-ray |
| EHF | electrohydraulic forming |
| EMTA | Eshelby-Mori-Tanka |
| ER | extrusion ratio |
| ERD | extrusion radial direction |
| EREV | extended range electric vehicle |
| ESC | electronic stability control |
| ESPEI | extensible, self-optimizing phase equilibrium infrastructure |
| ETD | extruded transverse direction |
| ETW | equivalent test weight |
| EVOCD | Engineering Virtual Organization for Cyber Design |

## F

| | |
|---|---|
| FARS | Fatality Analysis Reporting System |
| fcc | face centered cubic |
| Fe | iron |
| FE | finite element |
| FEA | finite element analysis |
| FEG | field emission gun |
| FEM | finite element modeling |
| FISIPE | Fibras Sinteticas de Portugal S.A. |
| FLD | forming limit diagram |
| FPB | four-point bend |
| FPI | fluorescent penetrant inspection |
| fs | femtoseconds |

| | |
|---|---|
| FSLW | friction stir linear welding |
| FSSW | friction stir spot weld/welding |
| FSW | friction stir welding |
| FY | fiscal year |

## G

| | |
|---|---|
| GEN I | first generation |
| GEN III | third generation |
| GGA | generalized gradient approximation |
| GSFE | generalized stacking fault energy |

## H

| | |
|---|---|
| H | hydrogen |
| HAZ | heat-affected zone |
| HER | hole expansion ratio |
| HIMAL | High Integrity Magnesium Automotive Components |
| HP | high pressure |
| HSBS | hot stamp boron steel |
| HSLA | high strength low alloy |
| HSS | high-strength steel |
| HWL | hardwood lignin |

## I

| | |
|---|---|
| ICAF | intergranular corrosion area fraction |
| ICME | Integrated Computational Materials Engineering (USAMP program) |
| IR | infrared |
| ISF | intrinsic stacking fault |
| ISFE | intrinsic stacking fault energy |
| ISV | internal state variable |

## K

| | |
|---|---|
| K–PhD | kindergarten through doctoral level |
| K-S | Kurdjumov-Sachs |

## L

| | |
|---|---|
| LBNL | Lawrence Berkeley National Laboratory |
| LCA | life-cycle assessment |
| LCCF | low cost carbon fiber |
| LFT | long fiber thermoplastic |
| LM | Lightweight Materials |
| LPPM | low pressure permanent mold (casting process) |
| LSEM | large strain extrusion machining |
| LSM | lanthanum strontium manganite |
| LSPR | laser-assisted, self-piercing riveting |

## M

| | |
|---|---|
| MD | molecular dynamics |
| MEAM | modified embedded atom method |
| MEARS | Mass Efficient Architecture for Roof Strength |
| MENA | Magnesium Elektron North America |
| MEP | minimum energy pathway |
| MFERD | Magnesium Front End Research and Development |
| Mg | magnesium |
| MGI | Materials Genome Initiative |
| Missouri S&T | Missouri University of Science and Technology |
| MKS | Material Knowledge System |
| Mn | manganese |
| MSF | multistage fatigue |
| MSD | mean square displacement |
| MSST | Mississippi State University |
| MSZ | magnesia-stabilized zirconia |

## N

| | |
|---|---|
| N | moles |
| Nd | neodymium |
| NDE | nondestructive evaluation |
| NDT | non destructive testing |
| NHTSA | National Highway Traffic Safety Administration |
| NIST | National Institute of Standards and Technology |
| NLA | nonlinear analysis |
| NPRM | Notice of Proposed Rulemaking |
| NSF | National Science Foundation |
| NSP | nonlinear strain path |
| NTRC | National Transportation Research Center |

## O

| | |
|---|---|
| ODB | offset deformable barrier |
| OEM | original equipment manufacturer |
| OPF | oxidized polyacrylonitrile fibers |
| ORNL | Oak Ridge National Laboratory |
| OSTP | Office of Science and Technology Policy |

## P

| | |
|---|---|
| PAN | polyacrylonitrile |
| PAW | projector augmented waves |
| PB | paint baked |
| PCA | principal components analysis |
| PCBN | polycrystalline cubic boron nitride |
| PCYS | polycrystal-based yield surface |
| PFSL | precursor fiber semi-production line |
| PMC | polymer-matrix composite |
| PNNL | Pacific Northwest National Laboratory |
| POD | probability of detection |
| PP | polypropylene |
| PPF | pulse pressure forming |

| | |
|---|---|
| ps | picoseconds |
| PSP | process-structure-property |
| PTC | project technical committee |
| PVD | physical vapor deposited |

## Q

| | |
|---|---|
| QP | quenching and partitioning |
| QPE | quasi-plastic-elastic |
| QQI | quasi-quasi-isotropic |

## R

| | |
|---|---|
| R&D | research and development |
| R&R | repeatability and reproducibility |
| RD | rolling direction |
| RE | rare earth |
| RI | resonant inspection |
| RPM | revolutions per minute |
| RSW | resistance spot welding |
| RT | radiographic testing |
| RT | room temperatures |
| RUC | representative unit cell |
| RVE | representative volume element |

## S

| | |
|---|---|
| SBIR | Small Business Innovation Research |
| SBSS | short beam shear strength |
| SCRLID | Southern Regional Center for Lightweight Innovative Designs |
| SEM | scanning electron microscope |
| SF | stacking fault |
| SFE | stacking fault energy |
| Si | silicon |
| SIMS | secondary ion mass spectrometry |
| SMC | sheet molding compound |

| | |
|---|---|
| SOM | solid oxygen-ion conducting membrane |
| SPF | superplastic forming |
| SRO | short range order |
| SULI | student undergraduate laboratory internships |
| SUV | sports utility vehicle |
| SWE | spot weld element |

## T

| | |
|---|---|
| TD | transverse direction |
| TMA | thermomechanical analysis |
| TMAC | testing machine for automotive composites |
| TMS | The Minerals, Metals, & Materials Society |
| TRC | textile reinforced composite |
| TRIP | transformation-induced plasticity |

## U

| | |
|---|---|
| UA | assembled underbody frame unit |
| UBS | ultimate bending stress |
| UHSS | ultra-high-strength-steels |
| UO | underbodies without the frames |
| U.S. | United States of America |
| USAMP | U.S. Automotive Materials Partnership |
| USW | ultrasonic welding |
| UTS | ultimate tensile strength |

## V

| | |
|---|---|
| VAMUCH | Variational Asymptotic Method for Unit Cell Homogenization |
| VASP | Vienna ab-initio simulation package |
| VE | vinyl ester |
| VG | variational Gaussian |
| VGCNF | vapor grown carbon nanofiber |
| VIC | video image correlation |
| VIN | vehicle identification number |

| | |
|---|---|
| VMT | vehicle mile traveled |
| VPSC | Visco-Plastic Self Consistent |
| VTP | Vehicle Technologies Program |

## X

| | |
|---|---|
| XRD | x-ray diffraction |

## Y

| | |
|---|---|
| YSZ | yttria-stabilized zirconia |

## Z

| | |
|---|---|
| zn | zinc |
| Zr | zirconium |