1. Synthesis and Processing

- ageing
- annealing
- anodization
- atomization
- blending
- bonding
- Casting
- Coating
- cold working
- combustion synthesis

Crystal Growth
- Bridgman technique
- Czochralski technique

Deposition
- chemical vapor deposition (CVD)
- laser deposition
- molecular beam epitaxy (MBE)
- physical vapor deposition (PVD)
- sputtering

- dynamic compaction
- electron beam methods
- electroplating
- foaming
- galvanisation
- high-speed deformation
- homogenisation/solutionisation
- hot working
- implantation

Infiltration
- liquid infiltration
- vapour infiltration

- slurry infiltration
- injection moulding
- ion-beam processing

Isothermal heat treatments
- austempering
- martenpering

Joining
- brazing
- diffusion bonding
- friction stir welding
- soldering
- welding

Laser Treatment
- laser annealing
- laser deposition
- laser welding
- liquid phase sintering
- liquid phase epitaxy (LPE)
- lithography
- mechanical alloying
- mechanical milling
- melt spinning
- metal injection moulding (MIM)
- mineralization
- processing
- plasma spraying
- plating
- photochemical processing
- powder consolidation
- powder metallurgy (PM)
- powder processing
- quenching
- reactive ion etching
- recycling
- self-propagating high-temperature synthesis (SHS)
- semi-solid processing

Severe Plastic Deformation (SPD)
- accumulative roll bonding (ARB)
- equal channel angular extrusion (ECAE)
- equal channel angular pressing (ECAP)
- equal channel angular pressing – back pressure (ECAP-BP)
- equal channel angular rolling (ECAR)
- friction
- high pressure torsion
- torsion
- sintering
- sol-gel

Solidification
- directional solidification
- eutectic solidification
- solidification microstructure
- monotectic solidification
- multicomponent solidification
- peritectic solidification
- rapid solidification
- spin-coating
- splat quenching
- sputtering
- strain ageing
- surface alloying
- tempering
- thermomechanical processing
- thin films
- tissue engineering
2. Characterization
acoustic methods
atom locating by channeling enhanced microanalysis (ALCHEMIE)
Brillouin scattering
critical exponent analysis
deep level transient spectroscopy (DLTS)
differential scanning calorimetry (DSC)
differential thermal analysis (DTA)
dynamic mechanical analysis
electrical resistivity/conductivity
ellipsometry
image analysis
ion microprobe (WDXS)
Kerr-Faraday-magnetometry

Mechanical Properties Testing
bending test
compression test
creep test
fatigue test
hardness test
high cycle fatigue
impact test
low cycle fatigue
microindentation
nanoindentation
scratch test
tension test
toughness

Microscopy and Microanalysis Techniques
analytical electron microscopy
atomic force microscopy (AFM)
atom-probe field-ion microscopy (AP-FIM)
convergent beam electron diffraction (CBED)
electron backscattering thermogravimetric analysis
electron backscattering diffraction (EBSD)
electron diffraction
electron energy loss spectroscopy (EELS)
electron holography
electron probe microanalysis (EPMA)
energy dispersive x-ray spectroscopy (EDXS)
energy filtering transmission electron microscopy
field-ion microscopy (FIM)
high angle annular dark field (HAADF)
high-resolution electron microscopy (HREM)
Lorenz microscopy
magnetic force microscopy (MFM)
orientation imaging microscopy (OIM)
scanning electron microscopy (SEM)
scanning/transmission electron microscopy (STEM)
scanning tunnelling microscopy (STM)
transmission electron microscopy (TEM)
three-dimensional atom probe (3DAP)
3D X-ray microscopy
tomographic atom probe (TAP)
wave-length dispersive X-ray spectroscopy
Z-contrast microscopy
Mössbauer spectroscopy
nuclear magnetic resonance (NMR)
nuclear reaction analysis
positron annihilation (PAL)
radiography
Rutherford backscattering (RBS)

Surface Analysis Techniques
Auger electron spectroscopy (AES)
ion scattering spectroscopy (ISS)
Infrared (IR) spectroscopy
low energy electron diffraction (LEED)
optical spectroscopy
Raman spectroscopy
reflection high-energy electron diffraction (RHEED)
secondary ion mass spectroscopy (SIMS)
x-ray photoelectron spectroscopy (XPS)
thermally stimulated acoustic methods
thermographimetric analysis
X-ray and Neutron Techniques
extended X-ray absorption fine structure (EXAFS, XANES)
neutron diffraction
small angle neutron scattering (SANS)
small angle x-ray scattering (SAXS)
synchrotron radiation
x-ray diffraction (XRD)
x-ray pole figures
(EFTEM) x-ray fluorescence
3. Material Type

**Amorphous Materials**
- bulk amorphous materials
- liquids
- metallic glasses
- non-metallic glasses (silicates)
- polymers

**Biomaterials**
- bone
- hydroxyapatite
- polymeric biomaterials

**Beryllides**

**Borides**

**Carbides**

**Carbon & Graphite**

**Cellular Materials**

**Ceramics**

**Cermets**

**Composites**
- ceramic matrix composites (CMC)
- fiber reinforced composites
- soft magnetic composites (SMC)
- metal matrix composites (MMC)
- particulate reinforced composites
- polymer matrix composites
- whisker reinforced composites

**Compounds**
- intercalation compounds
- intermetallic compounds
- ionic compounds
- semiconductor compounds
- dielectrics
- electroceramics
- fibers
- foams
- functionally graded materials (FGM)
- fuel cell materials
- fullerenes and related materials
- granular materials
- insulators
- Intermetallics
- iron aluminides
- nickel aluminides
- niobium aluminides
- titanium aluminides
- transition metal silicides

**Heusler alloys**

**Hydrides**

**Laves phases**

**Layered Structures**

**Liquids**

**Liquid Crystals**

**Macromolecular Materials**

**Materials with Reduced Dimensions**

**Metal & Alloys**

**Amorphous Materials**
- alkaline earth
- aluminium
- aluminium alloys
- copper
- copper alloys
- iron
- iron alloys
- magnesium
- magnesium alloys
- nickel
- nickel alloys
- platinum-group
- rare earth
- refractory metals
- semiconductor
- steels
- titanium
- titanium alloys
- transition metals
- minerals
- multilayers
- nanocomposite
- nanocrystalline materials
- nitrides
- optical materials
- Oxides
- amorphous oxides
- binary oxides
- crystalline oxides
- non-binary oxides
- perovskites
- Polymers
- amorphous polymers
- copolymers
- elastomeric polymers
- electrical conductivity of
- flow properties of
- melts and solutions of
- physical properties of
- structure of
- thin polymer films
- porous material
- powder material
- admixed
- lean
- prealloyed
- quasicrystals
- Semiconductors
- amorphous semiconductors
- compound semiconductors
- elemental semiconductors
- semiconductor devices
- semimetals
- shape memory alloys (SMA)
- silicides
- solid electrolytes
Steels
- austenitic steels
- bainitic steels
- carbides
- dual phases
- ferritic steels
- heat resistant steels
- high strength low alloy (HSLA) steels
- interstitial free (IF) steels
- maraging steels
- martensitic steels
- pearlitic steels
- stainless steels

Superconductors
- ceramic superconductors
- organic superconductors
- metallic superconductors

Thin Films
- coatings
- magnetic recording thin films
- magnetic thin films
- multilayer thin films

Whiskers
- zeolites

4. Properties and Phenomena
- acoustic properties
- adhesion
- buckling
- capillary phenomena
- catalysis
- cellular growth
- coarsening
- convection
- corrosion
- crystallization
- crystal growth
- crystal structure
- damping
- Decomposition
- ordering decomposition
- spinodal decomposition
- deformation structure
- deformation inhomogeneities
- deformation texture
- dendritic growth
- dielectric loss and relaxation
- Diffusion
- bulk diffusion
- diffusion in liquids
- grain boundary diffusion
- interface diffusion
- interdiffusion
- interstitial diffusion
- ionic diffusion
- multicomponent
- short circuit diffusion
- substitutional diffusion
- surface diffusion
- diffusion-induced grain boundary motion (DIGM)
- Dislocation
- dislocation boundaries
- dislocation dynamics
- dislocation mobility
- dislocation structure
- dislocation theory
- disorientation
- dynamic phenomena
- electrical properties
- electrochemistry
- electronic structure
- Embrittlement
- grain boundary embrittlement
- hydrogen embrittlement
- liquid metal embrittlement
- ferroelectricity
- Grain Boundaries
- coincidence site lattice (CSL)
- coincidence boundaries
- grain boundary cohesion
- grain boundary defects
Phase Transformations
- crystallization
- heterogeneous nucleation of phase transformations
- homogeneous nucleation of phase transformations
- martensitic phase transformation
- massive phase transformation
- nucleation and growth ordering
- order-disorder phenomena
- phase separation
- phase transformation kinetics
- polymorphic phase transformation
- spinoidal decomposition
- piezoelectricity
- plasma material interaction
- precipitation
- radiation effects
- Recovery
- abnormal subgrain growth
- annihilation
- subgrain coalescence
- subgrain growth
- Recrystallization
- continuous recrystallization
- discontinuous recrystallization
- dynamic recrystallization
- nucleation of recrystallization
- particle stimulated nucleation (PSN)
- primary recrystallization
- recrystallization kinetics
- recrystallization texture
- secondary recrystallization
- tertiary recrystallization
- static recrystallization
- reduced dimensions
- residual stresses
- Segregation
- interface segregation
- surface segregation
- stress migration
- Solidification
- directional solidification
- eutectic solidification
- kinetic solidification
- monotectic solidification
- multicomponent solidification
- peritectic solidification
- rapid solidification
- undercooling solidification
- superlattice
- Surface
- surface energy
- surface diffusion
- surface segregation
- surface structure

5. Theory, Computer Simulations and Modeling
- ab-initio electron theory
- analytical methods
- atomic potentials
- Avrami-Johnson-Mehl-Kolmogorov theory (JMAK)
- CALPHAD
- constitutive equations
- continuum mechanics
- density functional theory (DFT)
- electronic structure
- finite element modeling (FEM)
- finite difference modelling (FDM)
- finite volume modelling (FVM)
- first-principle electron theory
- full-potential calculations
- homogenisation
- kinetics self-organization & patterning
- lattice Boltzmann model
- local density approximations (LDA)
- Micromechanical Modeling
- finite element analysis (FEA)
- mean field analysis
- strain gradient plasticity
- dislocation theory
- work hardening modeling
- dislocation statistics
- dislocation dynamics
- cellular automaton
- cluster variation method
- molecular dynamics simulations (MD-simulations)
- non-equilibrium processes
- molecular statics simulations
- Monte Carlo simulations (MC-simulations)
- phase field modeling
- statistical mechanics
- Texture modelling
- Taylor models
- Viscoplastic self consistent models (VPSC)
- Grain Interaction Models
- thermodynamics
- total energy calculations
- Vertex models