

Work Experience

Staff Engineer Materials Science

Kennametal | Mar 2019–Oct 2019 | Latrobe, PA

- » Conduct R&D for cemented carbides and related materials
- » Document and enhance process parameters for manufacturing

Senior Materials Scientist

Halliburton | Oct 2013–Mar 2019 | Conroe, TX

Provide metallurgical, materials, and mechanical engineering technical expertise to improve drill-bit manufacturing

- » Test and release metal-matrix composite (MMC) materials to save cost and simplify manufacturing processes:
 - 2017 project implemented a new alloy that created a lower-cost, safer manufacturing process
 - 2016 project yielded cost savings of about \$1M per year
 - Documented project results in presentations and detailed reports
- » Advise and mentor team members on a variety of projects, including:
 - Improved test method that yielded additional material properties
 - Improved material composition to optimize strength and toughness (via design of experiments)
- » Develop and manage a comprehensive and aggressive IP strategy for materials and manufacturing:
 - Directed biweekly brainstorming meetings, resulting in about 70 patent applications
- » Create custom Matlab routines, including:
 - Heat-transfer simulation, which validated multiple patented designs for high-temperature insulation enclosures
 - Response-surface model correlating composite strength to composition
 - Material-database parser to generate six-sigma quality control charts for powder-size distribution
 - Micrograph-particle locator including property calculation, such as average particle spacing
 - Response-surface model parameter optimization for R² value
 - Bit performance modeling
- » Analyze and identify materials, morphologies, and microstructures via microscopy:
 - optical microscopy (OM), scanning electron microscopy (SEM), and energy-dispersive spectroscopy (EDS)
- » Work with a variety of metal-matrix composite (MMC) materials:
 - Alloys: copper, nickel, manganese, zinc, tin
 - Powders/grit: tungsten carbide, diamond, tungsten, nickel, copper, manganese, iron, cobalt, phosphorus, zinc
 - Ceramics: tungsten carbide (WC) and monolithic and fiber-composite alumina (Al₂O₃)

Academic Reviewer

Various Technical Journals | Oct 2011–Present

Conduct article reviews (over 100 to date) for these technical journals:

- » *Journal of Alloys and Compounds*
- » *Journal of Materials Engineering and Performance*
- » *Journal of Materials Science*
- » *Materials & Design*
- » *Metallurgical and Materials Transactions A*
- » *Science and Technology of Welding and Joining*
- » *Surface & Coatings Technology*
- » *Vacuum*

Please also see my [LinkedIn profile](#) and [résumé](#).

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Work Experience (cont.)

Technical Advisor (*Community Advisory Board*)

The MathWorks | Apr 2016–Present

- » Discuss upcoming features and perform administrative functions for the Matlab Central website

Technology Development Specialist

Pratt & Whitney (UTC), East Hartford, CT | 2011–13

Research and select optimal materials and compositions for a variety of parts in gas turbine engines

- » Advised engineers in materials, structures, design, project, and management roles:
 - Presented monthly material recommendations and status updates to executives
 - Coordinated and led various meetings to gain support for implementing new technology
- » Managed budgets (over \$300k) and provided guidance on additional budgets (over \$1M):
 - Directed a plating process-parameter design of experiments
 - Tested various polymers with and without plating to select optimal performer and/or minimize cost
- » Developed and implemented a comprehensive and aggressive IP strategy; filed over 50 patent applications:
 - Led a cross-sectional group of the company to submit a large and diverse group of IP disclosures
 - Named as an expert reviewer for the internal patent review committee
- » Coordinated projects with various additive manufacturing (AM) and plating/electroforming vendors:
 - AM processes include stereolithography (SLA), selective laser sintering (SLS), fused deposition modeling (FDM), electron-beam melting (EBM), laser-engineered net shaping (LENS), and direct-metal laser sintering (DMLS)

Doctoral and Post-doc Researcher Brigham Young University, Provo, UT | 2006–11 (*Funded by the Office of Naval Research*)

- » Published a highly cited review of transient liquid phase (TLP) and partial TLP (PTLP) bonding
- » Developed and documented a novel filtering procedure to identify ideal PTLP bond interlayer combinations
- » Conducted sessile-drop and bonding tests of metallic and ceramic materials:
 - metals: copper, gold, silver, palladium, aluminum, titanium, magnesium, cobalt, nickel, antimony, zinc, tin, lithium, indium, bismuth, lead, germanium, praseodymium, neodymium, cerium, tellurium, lanthanum, europium, and ytterbium
 - ceramics: cemented tungsten carbide (WC) and polycrystalline cubic boron nitride (PCBN)

Certification and Education

Professional Engineering License

PA State Registration Board for Professional Engineers, Land Surveyors and Geologists
Apr 2019–Present | License Pennsylvania PE 089452

Professional Engineering License (*Metallurgical and Materials Engineering, Mechanical Engineering*)

Texas Board of Professional Engineers | Dec 2014–Present | License Texas PE 118748

PhD, Mechanical Engineering (*Materials Science Emphasis*)

Brigham Young University, Provo, UT | Dec 2010 | 3.83 GPA

BS, Mechanical Engineering (*Math Minor*)

Brigham Young University, Provo, UT | Apr 2006 | 3.84 GPA

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Publications

- » “Partial transient liquid phase bonding, part I: A novel selection procedure for determining ideal interlayer combinations, validated against Al₂O₃ PTLP bonding experience,” *Metallurgical and Materials Transactions A*, 2013.
- » “Partial transient liquid phase bonding, part II: A filtering routine for determining all possible interlayer combinations,” *Metallurgical and Materials Transactions A*, 2013.
- » “Overview of Transient Liquid Phase and Partial Transient Liquid Phase Bonding,” *Journal of Materials Science*, 2011. Sapphire Prize finalist (cited over 250 times, over 12,000 downloads from SpringerLink)
- » “Joining Polycrystalline Cubic Boron Nitride and Tungsten Carbide by Partial Transient Liquid Phase Bonding,” PhD Dissertation, Brigham Young University, 2010.

Links to these publications are available at my [LinkedIn profile](#).

Technical Skills & Experience

Computer

- » Adobe Acrobat Pro, Illustrator, InDesign, Photoshop
- » JMP and Minitab
- » Macintosh, Windows, & Unix OSs
- » Matlab
- » Microsoft Office (Excel, Word, PowerPoint, Outlook)
- » Numerical Modeling
- » SAP

Engineering

- » Data Synthesis and Analysis
- » Heat Transfer (conduction, convection, radiation)
- » IP Strategy
- » Manufacturing processes
- » Non-destructive Inspection
- » Patents and Patent Applications
- » Project Management
- » Root-cause Analysis

Materials

- » Ceramics
- » Composites
- » Diamond
- » Energy-dispersive Spectroscopy (EDS)
- » Material Selection

» Materials Science

- » Metal–Ceramic Joining
- » Metallurgy
- » Microstructure
- » Optical Microscopy (OM)
- » Phase Diagrams
- » Polymers
- » Scanning Electron Microscopy (SEM)
- » Sessile-drop Testing (wetting)
- » Solid-state Diffusion

Mechanical

- » Composite Structures
- » Mechanical Engineering
- » Mechanical Testing
- » Static and Dynamic Analysis
- » Structural Analysis

Statistics

- » Design of Experiments
- » Regression
- » Response-surface Methodology
- » Six Sigma
- » Statistical Process-control Chart
- » T-statistic Test

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Patents & Patent Applications

- » Precipitation Hardened Partial Transient Liquid Phase Bond (US10071543)
- » Segregated Multi-Material Metal-Matrix Composite Tools (US10029305)
- » Mesh reinforcement for metal-matrix composite tools (US10029306)
- » Segregated Multi-Material Metal-Matrix Composite Tools (US10029301)
- » Composite Airfoil Bonded to a Metallic Root (US10024333)
- » Method of Bonding a Metallic Component to a Non-Metallic Component Using a Compliant Material (US9969654B2)
- » Insulation Enclosure with a Thermal Mass (US9950361)
- » Heat-Exchanging Mold Assemblies for Infiltrated Downhole Tools (US9943905)
- » Insulation Enclosure with Varying Thermal Properties (US9901982)
- » Insulation Enclosure with Compliant Independent Members (US9896886B2)
- » Insulation Enclosure with a Radiant Barrier (US9889502B2)
- » Plated Tubular Lattice Structure (US9789664B2)
- » Mold Assembly Caps Used in Fabricating Infiltrated Downhole Tools (US9718126B2)
- » Plated Instrumentation Probes and Sensors (US9663867B2)
- » Method for Joining Dissimilar Engine Components (US9586868B2)
- » Turbine Engine Duct (EP2923054B1)
- » Gas Turbine Engine with Reinforced Spinner (EP2915742B1)
- » Methods of Removing Shoulder Powder from Fixed Cutter Bits (US20170159367A1)
- » Metal-Matrix Composites Reinforced with a Refractory Metal (WO2016153733A1)
- » Compressive Residual Stress-Hardened Downhole Tool Shaft Region (WO2016195752A1)
- » MMC Downhole Tool Region Comprising an Allotropic Material (WO2016195753A1)
- » Cutter Bound to Matrix Drill Bits Via Partial Transient Liquid-Phase Bonds (WO2017058235A1)
- » Mechanical-Interlocking Reinforcing Particles for Use in Metal Matrix Composite Tools (WO2017052512A1)
- » Attachment of Polycrystalline Diamond Tables to a Substrate to Form a PCD Cutter Using Reactive/Exothermic Process (WO2017030554A1)
- » Macroscopic drill bit reinforcement (WO2016140675A1)
- » Hardfacing Metal Parts (WO2016209238A1)
- » Bit Incorporating Ductile Inserts (WO2016178693)
- » Mesoscale Reinforcement of Metal Matrix Composites (WO2016171711A1)
- » Methods of Fabricating Ceramic or Intermetallic Parts (WO2016171715A1)
- » Alternative Materials for Mandrel in Infiltrated Metal-Matrix Composite Drill Bits (WO2016159971A1)
- » Localized Binder Formation In a Drilling Tool (WO2016140677)
- » Surface Coating for Metal Matrix Composites (WO2016140646)
- » Two-Phase Manufacture of Metal Matrix Composites (WO2016133510)
- » Mold Transfer Assemblies and Methods of Use (WO2016122488A1)
- » Method of Bonding Two Structures and Corresponding Rotor Assembly (EP2921651A1)
- » Ceramic Covered Turbine Components (WO2015116347A1)
- » Mold Assemblies with Integrated Thermal Mass for Fabricating Infiltrated Downhole Tools (WO2016089374)
- » Steam-Blocking Cooling Systems That Help Facilitate Directional Solidification (US20160325349A1)
- » Thermal Sink Systems for Cooling a Mold Assembly (WO2016089362A1)
- » Mold Assemblies That Actively Heat Infiltrated Downhole Tools (US20160325343A1)
- » Integrated Heat-Exchanging Mold Systems (WO2016089373A1)
- » Mold Assemblies Used for Fabricating Downhole Tools (WO2016089365)
- » Attachment of Structures Having Different Physical Characteristics (US20150202707A1)
- » Bonded Combustor Wall for a Turbine Engine (WO2015054244)
- » Insulation Enclosure Incorporating Rigid Insulation Materials (WO2015199668)

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Patents & Patent Applications (cont.)

- » Composite Articles and Methods (US20140202170A1)
- » Fiber-reinforced Tools for Downhole Use (WO2015089267)
- » Bonded Multi-piece Gas Turbine Engine Component (WO2015069673A1)
- » Bonded Multi-piece Gas Turbine Engine Component (WO2015047698A1)
- » Lightweight Metal Parts Produced by Plating Polymers (WO2015073068A3)
- » CMC Airfoil with Monolithic Ceramic Core (WO2015031106A1)
- » Compliant Attachment for an Organic Matrix Composite Component (WO2015094420A1)
- » Plated Polymer Compressor (WO2015006438A1)
- » Hybrid Plated Composite Stack (WO2015006435)
- » Plated Polymers with Intumescent Compositions and Temperature Indicators (WO2015006490A1)
- » Plated Polymer Turbine Component (WO2015006485A1)
- » Transient Liquid Phase Bonding of Surface Coatings and Metal-covered Materials (WO2015006439A1)
- » Metal-encapsulated Polymeric Article (WO2015006421A1)
- » Tensile Test Geometry (WO2015006414A1)
- » Plated Polymeric Medical Products (WO2015006422A1)
- » Construction and Building Materials Formed from Plated Polymers (WO2015006493)
- » Plated Polymer Nacelle (WO2015006445A1)
- » Reinforced Plated Polymers (WO2015006457A1)
- » Plated Polymer Components for a Gas Turbine Engine (WO2015006479A1)
- » Plated Polymer Nosecone (WO2015017095A3)
- » Plated Polymer Fan (WO2015006433A3)
- » Industrial Products Formed from Plated Polymers (WO2015006397)
- » Plated Polymer Aviation Components (WO2015006427A8)
- » Vented Plated Polymer (WO2015006420)
- » High Temperature Additive Manufacturing for Organic Matrix Composites (WO2015053833)
- » Vehicular Engine and Transmission Components Made of Plated Polymers (WO2015006452)
- » Plated Polymeric Consumer Products (WO2015006464)
- » Counterfeit Proofing of Plated Polymers (WO2015006434A1)
- » Plated Polymer Vehicle Components (WO2015006471A1)
- » Non-contact Strain Measurement (WO2015006454A1)
- » Interlocked Plated Polymers (WO2015006428A1)
- » Plated Polymeric Sporting Goods (WO2015006472)
- » High-modulus Coating for Local Stiffening of Airfoil Trailing Edges (WO2015053832)
- » Erosion and Wear Protection for Composites and Plated Polymers (WO2015006487)
- » Plating a Composite to Enhance Bonding of Metallic Components (WO2015006488)
- » Plated Polymeric Wind Turbine Components (WO2015006400A1)
- » Gas Turbine Engine Ceramic Component Assembly and Bonding (WO2015009388)
- » Gas Turbine Engine Ceramic Component Assembly Attachment (WO2015009386)
- » Additive Manufacturing of Ceramic Turbine Components by Transient Liquid Phase Bonding Using Metal or Ceramic Binders (WO2015012911A3)
- » Additive Manufacturing of Ceramic Turbine Components by Partial Transient Liquid Phase Bonding Using Metal Binders (WO2015030879A2)
- » A Nonmetallic Airfoil with a Compliant Attachment (WO2015047450A2)
- » Transient liquid phase bonded tip shroud (WO2014150370A1)
- » Transient liquid phase bonded turbine rotor assembly (WO2014158598)
- » Composite Articles and Methods (WO2014081509A1)
- » Method of Manufacturing Complex Shaped Component (US20140093384A1)