Grant O. Cook III, PhD, PE

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Work Experience

Senior Materials Scientist
Halliburton | Oct 2013–Present | 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 R^2 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 (Al_2O_3)

Academic Reviewer
Various Technical Journals | Oct 2011–Present

Conduct article reviews (over 90 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, personal website, and résumé.

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 *(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 Al_2O_3 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)

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)