

HIMANSHU POKHARNA, PhD (PURDUE), MBA (WHARTON)

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Serial entrepreneur with 25 years of global experience in a variety of leadership roles. Emphasis on energy, materials and thermal technologies. Expertise in creating product strategy by mapping technology competencies to emerging market opportunities. Comfortable in deepest of technical discussions to board level business deliberations. Track record of successful introduction of new energy/mechanical/thermal technology in a broad array of computing, energy and Mil/aerospace products. Experienced in building and leading teams across geographies. Experienced in licensing and as an Expert Witness in patent disputes. Over 120 issued/pending patents, 5 journal publications, and many conference, industry presentations.

PROFESSIONAL EXPERIENCE

Deeia Inc. Founder/Principal

08/10-Present

A thermal consulting business with leading companies (Google, Xilinx, GoPro, Facebook, etc.) and startups as clients. Also developed a new Loop Thermosyphon technology for potential application in data center cooling.

- Developed thermal architecture of several products from computing to lighting, drones and robots.
- Provided expert witness services for thermal management related IP lawsuits with focus on liquid cooling.

Developed a patent pending loop thermosyphon two phase cooling system with application in server, 5G cabinet cooling, EV system cooling, battery cooling. Loop Thermosyphon has liquid cooling performance but is a passive system with 20 year lifetime. Performance validated by a Fortune 50 company.

Inficold India Pvt. Ltd. – Co-founder and Board Member

04/15-Present

A startup developing and commercializing thermal energy storage products.

- Founded and raised \$3.5 M in seed and grant funding. Founding CEO, but with the company moving to India in 2017, continued the responsibility for technology and strategic direction as a board member.
- Built a 70+ people team for developing a patented energy storage product which can attach to any refrigeration system and store energy in low cost phase change media to shift power consumption to low tariff duration or enable off grid solar based cold chain for milk and fruits/vegetables.

Deep Materials Inc. CEO and Director

01/19-Present

A Thermal materials company with focus on high performance Thermal Interface Materials (TIMs) & Heat Sinks

- Developed a variety of thermally conductive “gels” for application in consumer electronics, computing and automotive parts. Qualified them at various leading brands for their application in data center, consumer electronics, laptops, automotives etc.
- Setup a factory in China. Also setup a team there to interface with customers (FATP), and provide support at Foxconn (China, Vietnam), Quanta (China, Thailand), Chicony etc.

Sheetak Inc. Co-Founder, Board Member and VP Business Development

01/09-04/15

A Startup applying an innovative Peltier technology for power generation, and cooling.

- Raised >\$5M in funding and licensing revenues. Raised >\$10M in non-dilutive R&D grants from US DoE (ARPA-e)/DoD. Responsible for teaming, proposal, contract negotiations, and project management.
- Licensed a cooling technology to Godrej and Boyce India for an ultra-cheap refrigerator for the masses in India. The resulting refrigerators received coverage in the *Economist*, *WSJ* and *HBR*. Responsible for end to end delivery (engineering, design, China supply chain and component cost negotiations).
- Negotiated multiple licensing deals at ~\$ 1 M in licensing fees/royalties. Customers included two PE Controlled companies (Igloo and Oasis Water Coolers), and a large appliance company in the US.

Ventiva Inc. VP Applications Engineering **12/08-10/09**
Advisor/Consultant/VP (Various roles over time) **16-Present**

A startup developing air moving technology (no moving parts fan) with a licensing business model.

- Responsible for providing product direction, market analysis, customer analysis, & thermal engineering. Convinced the company to focus on tablet & wireless charger cooling for its first product.
- Led product evaluation (as a part of a licensing discussions) with a large Korean display maker. Currently working with the CEO and in house counsel on licensing discussions with an large consumer brand co.

k-Technology Corp. VP Product Development **07/07-12/08**

Leadership role in a defense hardware company, based upon an innovative high thermal conductivity material technology. Responsible for new product development.

- Led many SBIR projects for new product applications based upon the core materials technology.
- Evaluated partnership/acquisition opportunities and eventually assisted the CEO in selling the business to a larger player in the value chain.

Intel Corporation - Mobility Group **07/00-07/07**

Group Manager ('05-'07), Thermal Technology Manager ('02-'05), Staff Engineer ('00-'02)

- Overall responsibility for thermal, mechanical technology development and deployment for Intel's >\$12.5 B Mobile Products Group (now part of PC Client Group). Built and managed a cross functional team of 27 mechanical/thermal engineers and program managers across the globe (US, Taiwan, Japan, India).
- Responsible for developing team strategic plan, providing leadership, mentoring of managers and managing ~\$4 M annual budget. The team defined Intel's laptop PC thermal mechanical roadmap as well as develops, enables and communicates mechanical design of future laptop PCs. Most of the laptops today are based on the thermal/mechanical architecture originally developed by this team.
- Established Intel's mobile thermal technology advancement program. Formulated and managed collaborative development programs and investment in >15 supply chain partners for advancement in thermal component technology. The resulting products have led to 50% reduction in laptop thickness.
- Initiated heat pipe development programs with five of the leading heat pipe suppliers. Objective was to reduce evaporator and condenser resistances, reduce thickness to support thin laptops.
- Advised Intel Capital for investment in thermal, mechanical, fuel-cell and battery startups. Evaluated >15 investment opportunities. Managed Intel Capital investment in a company.
- Intel IP committee member. Responsible for evaluating for patent filing decision.
- Developed platform approach to future laptop designs by mechanical and thermal design of each part of the laptop, from CPU package, thermal solution, skins, keyboard, radios, board, display, and light source.

Applied Materials Inc. Senior Mechanical Engineer **07/97-07/00**

- Lead mechanical engineer for new product development group of low-k dielectric managing multiple hardware projects. Led cross-functional team for alpha exit of low-k CVD product.

EDUCATION

MBA, THE WHARTON SCHOOL, UNIVERSITY OF PENNSYLVANIA	2006
PhD, PURDUE UNIVERSITY, Nuclear Engineering	1997
BS, MS,¹ INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY, Mechanical Engineering	1990, 1992

¹ The degrees were Bachelor's of Technology and Master's of Technology, equivalent to a B.S. and an M.S. in the United States, respectively.

DETAILS OF THE PRESENTATIONS PAPPERS, AND PATENTS**KEYNOTE/INVITED ADDRESSES & PAPERS²,**

1. Pokharna, H., "Application of Thermal Management in Energy Devices", Delivered at the Annual Taiwan Thermal Management Association Meeting in Taipei, April 2011.
2. Pokharna, H., "Solid State Energy Converters Coupled with Heat Pipes for Refrigeration and Power Generation", Fujikura Annual Forum, Nov 2010.
3. Pokharna, H., "Notebook Thermal Technology: Need for Standardized Metrology – Call to Action for Taiwan Thermal Management Association" Delivered at the Annual Taiwan Thermal Management Association Meeting in Taipei, April 10, 2007.
4. Mongia, R; Kuroda, M., and Pokharna, H., "Heat Pipe Needs in Future Mobile Platforms", Keynote address to the 14th International Heat Pipe Conference, Florianópolis, Brazil, 2007.
5. Machiroutu, S.V., Kluge, B., Kuroda, M., and Pokharna, H., "Design and Test Methodologies of Use of Heat Pipes in Laptop PCs," Keynote address to the 8th International Heat Pipe Symposium, Kumamoto, Japan, 2006.
6. *Pokharna, H , et. al. , Microchannel Cooling in Computing Platforms: Performance Needs and Challenges in Implementation", Keynote address to the second ASME-JSME International Microchannel Conference, at Rochester, NY, 2004. Published: Proceedings of the Second International Conference on Microchannels and Minichannels (ICMM2004). 10.1115/ICMM2004-2325. Page 109-118.

SELECTED JOURNAL PUBLICATIONS

7. *Mongia, R., Bhattacharya, A., Pokharna, H, "Skin Cooling and Other Challenges in Future Mobile Form Factor Computing Devices", Microelectronics Journal – vol. 39, pp. 992-1000, 2008.
8. *Ishii M., Revankar S.T., Pokharna H., et. al. Scaling of the Purdue University Multidimensional Integral Test Assembly (PUMA) for GE SBWR. Nuclear Engineering and Design, Vol. 186, 1998, pp. 177-211.
9. *Pokharna H., Mori M., and Ransom V.H., "The Particle Fluid Model and Using Lagrangian Representation in Two-Phase Flow Modeling." Nuclear Engineering and Design, Vol. 175, 1997, pp. 59-69.
10. *Pokharna H., Mori M., and Ransom V.H, "Regularization of Two-Phase Flow Models- A comparison of Mathematical and Numerical Approaches" Journal of Computational Physics, Vol. 134, July, 1997.

PRESENTATIONS AND OTHER PUBLICATIONS

11. *K. Varadarajan, R. K. Mongia, H. Pokharna, J. Pan, K. Tien and M. Wu, "Lid cooling for notebooks," 2008 11th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, Orlando, FL, 2008, Published: *11th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, Orlando, FL, 2008*, pp. 591-597. pp. 591-597.
12. *Mongia, R.; Machiroutu, S., Pokharna, H.; "Mobile Thermal Challenges in Future Platforms", Presented at Thermes II, Santa Fe, NM, 2007. Published: *Thermal Challenges in Next*

² \ Papers, and presentations marked with * were peer reviewed.

- Generation Electronic Systems (THERMES II 2007)* Edited by Suresh V. Garimella, Amy S. Fleischer, Volume 39, Issue 7, Pages 929-1030 (July 2008)
13. *Machiroutu, S.V., Pokharna, H., Kuroda, M., "Challenges and Advances of Heat Pipes in Cooling Notebook Systems", Presented at Interpack Conference, Vancouver, British Columbia, Canada, July 8-12, 2007. Published: *Proc. ASME. 42770; ASME 2007 InterPACK Conference, Volume 1. IPACK2007-33249. Pages: 677-687*
 14. *Kuroda, M., Machiroutu, S.V., and Pokharna, H., "Use of Heat Pipes in Multiple Component Cooling in Laptop PCs," 8th International Heat Pipe Symposium, Kumamoto, Japan, 2006. Published: *Heat Pipe: Science and Technology ; Proceedings of the 8th International Heat Pipe Symposium*, Edited by Hideaki Imura, Nihon-Hito-Paipu-Kyōkai September 24 - 27, 2006 Kumamoto, Japan.
 15. *Khandani, S., Pokharna, H., Machiroutu, S., DiStefano, E., "Remote Heat Pipe Based Heat Exchanger performance in Notebook Cooling", Presented at the ASME Summer Heat Transfer Conference, San Francisco, 2005. Published: *Heat Transfer: Volume 4 ():715-719. doi:10.1115/HT2005-72069* Pages – 715-719.
 16. *DiStefano, E., Pokharna, H. and Machiroutu, S.V., "Raising the Bar for Heat Pipes in Notebook Cooling," 13th International Heat Pipe Conference, Shanghai, China, September 21–25, 2004. Published: *13th International Heat Pipe Conference: September 21-25, 2004, Shanghai, China* Edited by: Zhongguo Kong, Jian Ji, Shu Yan, Jiu Yuan. China Academy of Space Technology, 2004
 17. *Pokharna-H; Ransom-VH; Mori-M "Extension of the particle-fluid model for transient analysis of bubbly two-phase flow to branched flow passages". Eighth International Topical Meeting on Nuclear Reactor Thermal-Hydraulics. NURETH-8. Published: *New Horizons in Nuclear Reactor Thermal-Hydraulics. Atomic Energy Soc. Japan, Tokyo, Japan; 1997; vol-1 (xxi+xv+1830) pp. p.558-65.*
 18. *Pokharna H., and Ransom V. H., "Development of a Particle-Fluid Model for Transient Analysis of Bubbly Two-phase Flows in Parallel Channels." Presented at the International Mechanical Engineers Conference and Exposition, Atlanta, November, 1996. Published: *ASME FED, Vol-242.*
 19. *Pokharna H., Mori M. and Ransom V.H., "The Particle Fluid Model and Using Lagrangian Representation in Two-Phase Flow Modeling.", Presented at the Fourth US-Japan Conference in Tsukuba, July 1996.
 20. Ishii M., Revankar S.T., Pokharna H. et. al. "Scientific Design of Purdue University Multi-Dimensional Integral Test Assembly (PUMA) for GE SBWR.", NUREG/ CR-6309, (National report published by Nuclear Regulatory Commission). 1996. Published: Proceedings of the 7th International Meeting on Nuclear Reactor Thermal-Hydraulics (NURETH 7), Sep. 10-15, 1995, Saratoga Springs, New York.
 21. *Ishii M., Revankar S.T., Pokharna H., and Ransom V.H., "Scaling for Integral Simulation of Thermalhydraulic Phenomena in SBWR during LOCA.", Presented at NURETH-7, Saratoga Springs, NY, Sep10-15, 1995. Published: Proceedings of the 7th International Meeting on Nuclear Reactor Thermal-Hydraulics (NURETH 7), Sep. 10-15, 1995, Saratoga Springs, New York. Compiled by: R. C. Block, F. Feiner. pp: 1272-1290/
 22. *Pokharna H., Lele S., Wang W., Ishii M., Ransom V.H., "Investigation of Scaling Criterion Using RELAP5 for SBWR Integral Test Facility Design." Presented at ANS Annual Meeting, San Francisco, Nov14-18, 1993. Published: *Transactions of the American Nuclear Society, 540-541.*

23. *Pokharna H. and Doshi J.B., "Analysis of Dynamic Instability in Boiling Systems.", Presented at Winter Annual Meeting of ASME, Los Angeles, 1992. Published: Proceedings of Winter Annual Meeting, Anaheim, CA, USA 11/08-13/92. Pages: 1-9.

PATENTS

Issued US patents:

Publication Number	Title
US9903621B1	Cooling system with thermal battery
US9574832B2	Enabling an aluminum heat exchanger with a working fluid
US8043703B2	Thermally conductive graphite reinforced alloys
US7494628B2	Apparatus for abatement of by-products generated from deposition processes and cleaning of deposition chambers
US7443670B2	Systems for improved blower fans
US7308931B2	Heat pipe remote heat exchanger (RHE) with graphite block
US7300244B2	Cooling fan noise reduction apparatus, systems, and methods
US7269005B2	Pumped loop cooling with remote heat exchanger and display cooling
US7243497B2	Apparatus to use a refrigerator in mobile computing device
US7288895B2	System to improve display efficiency based on recycling local heat source
US7283360B2	Enhanced flow channel for component cooling in computer systems
US7281388B2	Apparatus to use a refrigerator in mobile computing device
US7272006B2	IC coolant microchannel assembly with integrated attachment hardware
US7259965B2	Integrated circuit coolant microchannel assembly with targeted channel configuration
US7203064B2	Heat exchanger with cooling channels having varying geometry
US7193316B2	Integrated circuit coolant microchannel with movable portion
US7123479B2	Enhanced flow channel for component cooling in computer systems
US7104313B2	Apparatus for using fluid laden with nanoparticles for application in electronic cooling
US7060234B2	Process and apparatus for abatement of by products generated from deposition processes and cleaning of deposition chambers
US7048038B2	Increased thermal capability of portable electronic device in stationary or docked mode
US7031159B2	Parallel heat exchanger for a component in a mobile system
US7023697B2	Actuation membrane for application to a card slot of a system
US6958912B2	Enhanced heat exchanger
US6906919B2	Two-phase pumped liquid loop for mobile computer cooling
US6899763B2	Lid cooling mechanism and method for optimized deposition of low-K dielectric using TR methylsilane-ozone based processes
US6937472B2	Apparatus for cooling heat generating components within a computer system enclosure
US6903930B2	Parallel heat exchanger for a component in a mobile system
US6845625B1	Reversible two-phase and refrigeration loop
US6837057B2	Docking station to cool a computer
US6845008B2	Docking station to cool a notebook computer
US6837058B1	Tablet air cooling dock
US6801430B1	Actuation membrane to reduce an ambient temperature of heat generating device
US6795311B2	Method and apparatus for cooling portable computers
US6674640B2	Increased thermal capability of portable electronic device in stationary or docked mode

US6646874B2	Mobile computer system with detachable thermoelectric module for enhanced cooling capability in a docking station
US6596343B1	Method and apparatus for processing semiconductor substrates with hydroxyl radicals
US6595022B2	Computer system having a refrigeration cycle utilizing an adsorber/desorber for purposes of compression
US6528116B1	Lid cooling mechanism and method for optimized deposition of low-k dielectric using tri methylsilane-ozone based processes
US6506994B2	Low profile thick film heaters in multi-slot bake chamber
US6415612B1	Method and apparatus for external cooling an electronic component of a mobile hardware product, particularly a notebook computer, at a docking station having a thermoelectric cooler
US6358327B1	Method for endpoint detection using throttle valve position
US6255222B1	Method for removing residue from substrate processing chamber exhaust line for silicon-oxygen-carbon deposition process

Applied/Pending US Patents (Published):

Publication Number	Title
US20160133814A1	FUEL-FLEXIBLE THERMAL POWER GENERATOR FOR ELECTRIC LOADS
US20150155413A1	SOLAR THERMOELECTRIC GENERATOR WITH INTEGRATED SELECTIVE WAVELENGTH ABSORBER
US20140318152A1	METHOD AND APPARATUS FOR THERMOELECTRIC COOLING OF FLUIDS
US20130048250A1	HEAT PIPE MADE OF COMPOSITE MATERIAL AND METHOD OF MANUFACTURING THE SAME
US20090255660A1	High Thermal Conductivity Heat Sinks With Z-Axis Inserts
US20090166014A1	Enabling an aluminum heat exchanger with a working fluid
US20090135560A1	HIGH EFFICIENCY FLUID MOVERS
US20090075120A1	Thermally conductive graphite reinforced alloys
US20090002939A1	Systems and methods for fan speed optimization
US20080130221A1	Thermal hinge for lid cooling
US20070284089A1	Method, apparatus and system for carbon nanotube wick structures
US20070227707A1	Method, apparatus and system for providing for optimized heat exchanger fin spacing
US20070217147A1	INTEGRATED CIRCUIT COOLANT MICROCHANNEL ASSEMBLY WITH TARGETED CHANNEL CONFIGURATION
US20070146993A1	Method, apparatus and computer system for enhancement of thermal energy transfer
US20070177349A1	High efficiency fluid mover
US20070076376A1	Method, apparatus and computer system for providing for the transfer of thermal energy
US20070077139A1	Cooling fan noise reduction apparatus, systems, and methods
US20070076374A1	IC coolant microchannel assembly with integrated attachment hardware
US20070002541A1	Enhanced flow channel for component cooling in computer systems
US20060226539A1	Integrated circuit coolant microchannel assembly with targeted channel configuration
US20060198769A1	Apparatus for abatement of by-products generated from deposition processes and cleaning of deposition chambers
US20060131733A1	Integrated circuit coolant microchannel with movable portion
US20060152900A1	Systems for improved blower fans
US20060113066A1	Heat exchanger configuration for pumped liquid cooling computer systems
US20060113064A1	Heat pipe remote heat exchanger (RHE) with graphite block

US20050285261A1	Thermal management arrangement with channels structurally adapted for varying heat flux areas
US20050284166A1	Apparatus to use vapor compression refrigeration in a mobile computing device
US20050217278A1	Apparatus to use a magnetic based refrigerator in mobile computing device
US20050219819A1	Methods to improve heat exchanger performance in liquid cooling loops
US20050217827A1	Apparatus to use a refrigerator in mobile computing device
US20050217279A1	Apparatus to use a refrigerator in mobile computing device
US20050139345A1	Apparatus for using fluid laden with nanoparticles for application in electronic cooling
US20050141195A1	Folded fin microchannel heat exchanger
US20050146852A1	Parallel heat exchanger for a component in a mobile system
US20050145371A1	Thermal solution for electronics cooling using a heat pipe in combination with active loop solution
US20050128702A1	Heat exchanger with cooling channels having varying geometry
US20050122688A1	Enhanced flow channel for component cooling in computer systems
US20050103480A1	Enhanced heat exchanger
US20050111183A1	Pumped loop cooling with remote heat exchanger and display cooling
US20050104526A1	System to improve display efficiency based on recycling local heat source
US20050099775A1	Pumped liquid cooling for computer systems using liquid metal coolant
US20050126761A1	Heat pipe including enhanced nucleate boiling surface
US20050068724A1	Two-phase pumped liquid loop for mobile computer cooling
US20050058867A1	Integrated platform and fuel cell cooling
US20050058866A1	Integrated platform and fuel cell cooling
US20050013116A1	Actuation membrane for application to a card slot of a system
US20040261421A1	TABLET AIR COOLING DOCK
US20040223302A1	Apparatus for cooling heat generating components within a computer system enclosure
US20040201959A1	Increased thermal capability of portable electronic device in stationary or docked mode
US20040123604A1	Docking station to cool a computer
US20040123977A1	External attachable heat exchanger
US20040125562A1	Parallel heat exchanger for a component in a mobile system
US20030221621A1	Method and apparatus for processing semiconductor substrates with hydroxyl radicals
US20030123223A1	Method and apparatus for cooling portable computers
US20030066482A1	Lid cooling mechanism and method for optimized deposition of low-K dielectric using TRI methylsilane-ozone based processes
US20020190051A1	LOW PROFILE THICK FILM HEATERS IN MULTI-SLOT BAKE CHAMBER
US20030017087A1	Process and apparatus for abatement of by products generated from deposition processes and cleaning of deposition chambers
US20030002252A1	Increased thermal capability of portable electronic device in stationary or docked mode
US20030000231A1	Computer system having a refrigeration cycle utilizing an adsorber/desorber for purposes of compression
US20020186531A1	Mobile computer system with detachable thermoelectric module for enhanced cooling capability in a docking station
US20020141152A1	Docking station to cool a notebook computer

Issued/Applied/Pending International Patents (Published):

Publication Number	Title
EP1665434B1	INTEGRATED PLATFORM AND FUEL CELL COOLING INTEGRIERTE PLATTFORM UND BRENNSTOFFZELLENKÜHLUNG REFROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
EP1148150B1	Method and apparatus for processing semiconductor substrates with hydroxyl radicals Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen Procédé et appareillage pour le traitement des substrats de sémiconducteur par des radicaux hydroxylés
EP1671218B1	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP REVERSIBLE ZWEIPHASEN- UND KÜHLSCHLEIFE BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
EP1623612B1	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMSKARTENSCHLITZ MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
EP2807432A1	METHOD AND APPARATUS FOR THERMOELECTRIC COOLING OF FLUIDS VERFAHREN UND VORRICHTUNG ZUR THERMOELEKTRISCHEN KÜHLUNG VON FLÜSSIGKEITEN PROCÉDÉ ET APPAREIL DE REFROIDISSEMENT THERMOÉLECTRIQUE DE FLUIDES
EP1148150A3	Method and apparatus for processing semiconductor substrates with hydroxyl radicals Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen Procédé et appareillage pour le traitement des substrats de sémiconducteur par des radicaux hydroxylés
EP1665434A2	INTEGRATED PLATFORM AND FUEL CELL COOLING INTEGRIERTE PLATTFORM UND BRENNSTOFFZELLENKÜHLUNG REFROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
EP1671218A2	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP REVERSIBLE ZWEIPHASEN- UND KÜHLSCHLEIFE BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
EP1623612A2	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMSKARTENSCHLITZ MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
EP1148150A2	Method and apparatus for processing semiconductor substrates with hydroxyl radicals Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen Procédé et appareillage pour le traitement des substrats de sémiconducteur par des radicaux hydroxylés
EP1079000A1	Method for removing residue from an exhaust line Verfahren zur Entfernung von Absetzungen in einer Abgasleitung Procédé d'élimination les dépôts dans une ligne d'échappement
EP1077274A1	Method for depositing thin films in particular of a low-k dielectric Verfahren zur Abscheidung von dünnen Schichten insbesondere eines Dielektrikums mit niedrigem k-Wert Méthode de déposition des couches minces notamment d'un matériau diélectrique à faible constante diélectrique
WO2013173450A9	INTEGRATED SELECTIVE WAVELENGTH ABSORBER SOLAR THERMOELECTRIC GENERATOR GÉNÉRATEUR THERMOÉLECTRIQUE SOLAIRE AVEC ABSORBEUR DE LONGUEUR D'ONDE SÉLECTIF INTÉGRÉ
WO2013074057A1	METHOD AND APPARATUS FOR THERMOELECTRIC COOLING OF FLUIDS PROCÉDÉ ET APPAREIL DE REFROIDISSEMENT THERMOÉLECTRIQUE DE FLUIDES

WO2009035666A3	THERMALLY CONDUCTIVE GRAPHITE REINFORCED ALLOYS ALLIAGES THERMO-CONDUCTEURS RENFORCÉS PAR DU GRAPHITE
WO2009035666A2	THERMALLY CONDUCTIVE GRAPHITE REINFORCED ALLOYS ALLIAGES THERMO-CONDUCTEURS RENFORCÉS PAR DU GRAPHITE
WO2008079430A3	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES PROCÉDÉ, APPAREIL ET SYSTÈME POUR STRUCTURES EN RÉSEAU CAPILLAIRE À NANOTUBES DE CARBONE
WO2008079430A9	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES PROCÉDÉ, APPAREIL ET SYSTÈME POUR STRUCTURES EN RÉSEAU CAPILLAIRE À NANOTUBES DE CARBONE
WO2008079430A2	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES PROCÉDÉ, APPAREIL ET SYSTÈME POUR STRUCTURES EN RÉSEAU CAPILLAIRE À NANOTUBES DE CARBONE
WO2008008085A3	IC COOLANT MICROCHANNEL ASSEMBLY WITH INTEGRATED ATTACHMENT HARDWARE ENSEMBLE À MICRO-CANAUX DE RÉFRIGÉRANT DE CIRCUIT INTÉGRÉ AVEC MATÉRIEL DE FIXATION INTÉGRÉ
WO2008008085A2	IC COOLANT MICROCHANNEL ASSEMBLY WITH INTEGRATED ATTACHMENT HARDWARE ENSEMBLE À MICRO-CANAUX DE RÉFRIGÉRANT DE CIRCUIT INTÉGRÉ AVEC MATÉRIEL DE FIXATION INTÉGRÉ
WO2007062208A1	HIGH EFFICIENCY FLUID MOVER DISPOSITIF DE DEPLACEMENT DE LIQUIDE A HAUT RENDEMENT
WO2007041123A1	IC COOLANT MICROCHANNEL ASSEMBLY WITH INTEGRATED ATTACHMENT HARDWARE ENSEMBLE MICROCANAL DE REFROIDISSEMENT A CIRCUIT INTEGRE AVEC MATERIEL JOINT
WO2006074447A3	SYSTEMS FOR IMPROVED BLOWER FANS SYSTEMES POUR VENTILATEURS AMELIORES
WO2005033917A8	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
WO2006074447A2	SYSTEMS FOR IMPROVED BLOWER FANS SYSTEMES POUR VENTILATEURS AMELIORES
WO2005029626A3	INTEGRATED PLATFORM AND FUEL CELL COOLING REFROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
WO2005051065A3	PUMPED LIQUID COOLING FOR COMPUTER SYSTEMS USING LIQUID METAL COOLANT REFROIDISSEMENT POUR SYSTEMES INFORMATIQUES PAR LIQUIDE DE REFROIDISSEMENT METALLIQUE POMPE
WO2005033917A3	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
WO2005067038A1	FOLDED FIN MICROCHANNEL HEAT EXCHANGER ECHANGEUR DE CHALEUR A MICROCANAUX A AILETTE REPLIEE
WO2005033917A2	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
WO2005051065A2	PUMPED LIQUID COOLING FOR COMPUTER SYSTEMS USING LIQUID METAL COOLANT REFROIDISSEMENT POUR SYSTEMES INFORMATIQUES PAR LIQUIDE DE REFROIDISSEMENT METALLIQUE POMPE

WO2005029626A2	INTEGRATED PLATFORM AND FUEL CELL COOLING REFRROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
WO2004103048A3	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
WO2004103048A2	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
DE602004008615T2	EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMKARTENSCHLITZ
DE112006000130B4	Lüfteranordnung für Kühlsysteme
DE112006000130T5	Systeme für verbesserte Kühleinrichtungen, wie Lüfter
DE112007001304T5	Verfahren, Vorrichtung und System für Kohlenstoffnanoröhrendochtstrukturen
JP2002064095A	METHOD AND DEVICE FOR PROCESSING SEMICONDUCTOR SUBSTRATE WITH HYDROXYL RADICAL The processing method and apparatus of a semiconductor substrate using a hydroxyl radical
JP2001140076A	IMPROVED METHOD FOR REMOVING RESIDUE FROM EXHAUST LINE OF SUBSTRATE TREATMENT CHAMBER TO DEPOSIT SILICON- OXYGEN-CARBON The method improved in order to remove residue from the gas discharge line of the substrate treating chamber which performs the deposition process of silicon silicone- oxygen-carbon
KR1024757B1	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES The method for the carbon nanotube wick structure, and the apparatus and system.
KR715074B1	METHOD AND APPARATUS FOR PROCESSING SEMICONDUCTOR SUBSTRATES WITH HYDROXYL RADICALS METHOD AND APPARATUS FOR PROCESSING SEMICONDUCTOR SUBSTRATE WITH HYDROXYL RADICAL A method and apparatus for processing the semiconductor substrate as the hydroxyl radical.
KR696030B1	IMPROVED METHOD FOR REMOVING RESIDUE FROM SUBSTRATE PROCESSING CHAMBER EXHAUST LINE FOR SILICON-OXYGEN-CARBON DEPOSITION PROCESS METHOD FOR REMOVING RESIDUE FROM EXHAUST LINE The method for removing the residue from the substrate processing chamber exhaust line of the silicon-oxygen - carbon vapor deposition process.
KR2009009927A	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES The method for the carbon nanotube wick structure, and the apparatus and system.
KR2006006961A	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM The actuation membrane for applying to the card slot of the system.
KR2001021403A	METHOD FOR REMOVING RESIDUE FROM EXHAUST LINE
CN101438402A	Method, apparatus and system for carbon nanotube wick structures
CN101317265A	IC coolant microchannel assembly with integrated attachment hardware IC coolant micro-channel assembly with integrated connecting component
CN101133377A	Systems for improved blower fans
CN101015082A	Integrated platform and fuel cell cooling Cooling of integration platform and fuel cell
CN1882900A	Reversible two-phase and refrigeration loop a reversible two-phase and refrigeration loop
CN1799297A	An actuation membrane for application to a card slot of a system driving film for application to the system slot
CN101438402B	Method, apparatus and system for carbon nanotube wick structures Method, device and system for carbon nano-tube core structure.

CN1799297B	An actuation membrane for application to a card slot of a system applied to the system slot of driving film
CN101133377B	Systems for improved blower fans for improved blower fan system
CN101317265B	IC coolant microchannel assembly with integrated attachment hardware with integrated connection part of IC coolant micro-channel assembly
CN100565996C	Integrated platform and fuel cell cooling Cooling of integration platform and fuel cell
CN100447707C	Reversible two-phase and refrigeration loop Method and system for reversible switching of two-phase and refrigeration loop
TWM502162U	Composite material heat pipe
TW201309997A	Composite material heat pipe and manufacturing method thereof
TWI372138B	Heat pipe, apparatus and system with carbon nanotube wick structures
TWI324296B	Systems for improved blower fans
DE60139912D1	Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen
DE602004022566D1	REVERSIBLE ZWEIPHASEN- UND KÜHLSCHLEIFE
TWI315463B	Ic coolant microchannel assembly with integrated attachment hardware
TW200806576A	Method, apparatus and system for carbon nanotube wick structures
DE602004008615D1	EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMSKARTENSCHLITZ
TW200720898A	Ic coolant microchannel assembly with integrated attachment hardware
TW200629048A	Systems for improved blower fans
TWI267338B	Apparatus for cooling heat generating devices
TW200525340A	Pumped liquid cooling for computer systems using liquid metal coolant
TWI237921B	Integrated platform and fuel cell cooling
TW200526107A	Folded fin microchannel heat exchanger
TW200511637A	Integrated platform and fuel cell cooling
TW200425829A	An actuation membrane for application to a card slot of a system

EXPERT WITNESS ENGAGEMENTS

- Represented the defendant for the Case No. 3:12-cv-04498-EMC: ASETEK HOLDINGS, INC. and ASETEK A/S, Plaintiffs, v. COOLIT SYSTEMS INC., Defendant. Prepared expert reports for patent invalidity, patent infringement, rebuttal to opposing expert witness reports of invalidity and infringement reports. Provided testimony during three-day deposition (2014)
- Prepared IPR 2014-01172. Patent no. 8,749,968 related to server thermal management.
- Represented the defendant in a patent lawsuit involving mechanical aspects of a vapor chamber product used in computing products thermal management. Provided expert report on claim construction and testified during deposition (district court litigation 17-cv-05363-JSW).
- Prepared expert reports for IPRs (2019-00144, 2019-00146, 2019-000334, 2019-00337, 2019-00146) for three patents (US 7066240, 7100679, 7100680) related to the abovementioned lawsuit. Provided deposition testimonies related to these IPRs.
- Retained by Patent owner as an expert for Ex Partes Review of a blast furnace cooling stove patent (2019).

- Prepared expert report for IPRs for a patent on liquid cooling for thermal management of electronics (IPR2019-00705). Deposition on Feb 4, 2020.
- Serving as an expert witness for the matter pending before the U.S. District Court, Northern District of California between Asetek Danmark A/S versus CoolIT Systems; case number 3:19-cv-00410-EMC. Provided claim construction report and deposition testimony for the same.
- Represented the defendant for IPR 2020-00825, challenging patent no. 10,274,266. Deposition: Feb '21 via zoom.
- Represented the defendant for IPR 2020-00747, challenging patent no. 9,057,567. Deposition: Feb 21 via zoom.
- Represented the defendant Cooler Master Co., Ltd. / CMI USA Inc. in opposing a motion for contempt sanctions by Asetek Denmark A/S. (Case no. 3:13-cv-00457-JST). Provided expert declaration and deposition testimony in June 2021.
- Provided expert report regarding infringement of US Patent no. 8,746,330; 9,057,567; and 10,274,266. Also provided expert report in response to opposition invalidity report of these patents. Two depositions in Jan 2022 related to infringement and invalidity respectively.
- Representing the petitioner for IPR challenging US patent no. 10,599,196 B2 related to liquid cooling (IPR2021-01196). Provided expert report. Deposition in March 2022.
- Representing the petitioner for IPR challenging US patent no. 10,613,601 B2 related to liquid cooling (IPR2021-01195). Provided expert report. Deposition in March 2022.
- Retained as an expert witness in an immersion cooling patent dispute by plaintiff Midas Green Technologies (case no. 6:22-cv-00050-ADA). Inspected accused facilities around Texas, provided expert report on infringement and other infringing alternatives. Deposed in Feb 2024 for my report. Trial expected in June 24 (Currently on hold).
- Retained as an expert witness in an air-cooling related ITC patent infringement by plaintiff Manufacturing Resource International (MRI) - (case no: 2:22-cv-00320) against Samsung. Provided expert report on claim construction and deposed in Feb 2023 for the same. Also provided infringement reports and validity reports. Deposed in April 2023 for infringement, validity and domestic industry analysis. Also deposed in July 2023. **Testified in ITC trial in July 2023.**
- Provided expert report and deposition for IPR2023-00255. Represented patent owner MRI.
- Retained as an expert witness in a refrigeration and ice maker **ITC Case (337-TA-1369)** between Hoshizaki America vs. Blue Air FSE LLC & Bluenix Co, Ltd. Representing defendant Bluenix and have provided claim construction, patent invalidity and non-infringement reports. Deposition in March 2024. **Testified in the ITC trial in May 2024.**
- Retained as an expert witness in a liquid cooling ITC case (337-TA-1394) between CoolerMaster entities and Enermax, Apaltek etc. Representing the defendants. Provided deposition testimony in Oct 2024 for invalidity and non-infringement and provided testimony during trial Dec 2-6. 2024.

- Retained as an expert witness for a lawsuit between SuperCooler Technologies and Coca-Cola Company (Case no 6:23-cv-00187-CEM-RMN in middle district of Florida- relating to refrigeration equipment and super fast cooling of beverages) involving misappropriation of trade secrets, breach of contract and other topics. Case is stayed currently.