

Venkat Selvamanickam

Education

UNIVERSITY OF HOUSTON	Ph.D., Materials Engineering (1992)
UNIVERSITY OF HOUSTON	M.S., Mechanical Engineering (1988)
REGIONAL ENG. COLLEGE (now NIT), TIRUCHI, INDIA	B.E. (Honors), Mechanical Eng. (1986)

Employment

UNIVERSITY OF HOUSTON		
M.D. Anderson Chair Professor of Mechanical Engineering		9/2008 onwards
PHILIPS ELECTRONICS (formerly Intermagnetics)		(5/94 – 8/08)
Vice President & Chief Technology Officer of SuperPower		
OAK RIDGE NATIONAL LABORATORY		(5/93 - 5/94)
Research Associate		
TEXAS CENTER FOR SUPERCONDUCTIVITY		
Post-doctoral fellow		(9/92 - 4/93)

Research Accomplishments

- Demonstrated a unique technology to fabricate single-crystalline-like films on flexible, polycrystalline substrates over length scales of more than a kilometer.
- Developed thin film processing techniques for hetero-epitaxial growth of complex oxide materials such as perovskites, fluorites, bixbyites, pyrochlores, and rock-salts, by Ion Beam Sputtering, Magnetron Sputtering, E-beam Evaporation, Metal Organic Chemical Vapor Deposition (MOCVD), and Pulsed Laser Ablation.
- Developed a unique MOCVD process and equipment to control vapor phase reaction, phase equilibria, and growth kinetics to achieve superior electrical performance including world-records for the highest critical current at all length scales as well as the fastest superconductor deposition process (about 10 times faster than competing processes)
- Developed a nano-scale (7 nm to 80 nm) 5-layer oxide buffer architecture to achieve superior diffusion, epitaxy, texture, interfacial, and mechanical properties over lengths of 1,500 meters of tape.
- Engineered nano-defects (1 to 10 nm) into thin film structure to enhance the magnetic properties of HTS tape and achieved the world record of highest magnetic field generated at 77 K by any superconductor.
- Repeatedly successful in employing the Materials Science triangle of Process-Microstructure-Property relationships to engineer various materials architectures to meet end-use applications requirement.
- Conceived and demonstrated a novel crystal growth technique to produce large single-crystalline REBaCuO with a world-record critical current performance in bulk ceramics.

Publication & Patents

- Published more than 130 papers in several major journals & including book chapters
- Authored the most cited paper in superconductivity and the third-most cited in Physics during March-April 1990 ; more than 560 citations to date.
- Authored 45 U.S. patent applications, and over 60 international patent applications, 21 of which have been awarded U.S. and international patents
- Editor of a book on “Flux Pinning and ac Losses”

Awards & Recognition

- Received the ***Presidential Early Career Achievement (PECASE) Award*** from the White House in 1996. This award is the highest honor bestowed by the U.S. Government on outstanding scientists and engineers beginning their independent careers. *Only-ever award recipient outside academia or research laboratories.* Received a grant of \$500,000 for 5 years to conduct research on High Temperature Superconductivity in collaboration with the U.S. Air Force.
- Named as *Superconductor Industry Person of Year* for 2004 by Superconductor Week, chosen by a panel of world-renowned experts on Superconductivity. This award is given for achievement in science & technology, advocacy in institutions, government, or industry, leadership/vision that assisted others in the advancement of the technology, and promotion of the technology. This award has been made to only 6 recipients including two CEOs, and the Deputy Director General of the Japanese Superconductivity program.
- Named as one of *New York Capital Region’s top forty business leaders* under the age of forty in 2004 by the Business Review magazine (in a competitive selection process)
- Resolution passed by the Schenectady County Legislature on June 14, 2005, acknowledging accomplishments in 2004 – 2005.
- R&D 100 award in 2007 and two Federal Laboratory Consortium (FLC) awards in 2008 with Los Alamos and Oak Ridge National Laboratories

Leadership-Team Building & Establishing a World-class Organization

- Built and managed a basic and applied research high-performance team of 42-members consisting of 8 Ph.D. scientists, 12 engineers and 22 technicians.
- Led organization to a distinction of “World Class” six years in a row (score higher than 90%) and a ranking of #1 or #2 six years in a row since 2002 among all technology developers in the U.S. by an independent Peer review panel under the auspices of the U.S. DOE.
- Completed the world’s first significant delivery of 2G HTS wire (10,000 m) to build a 30 m cable for the DOE Flagship program of Albany Cable Project., which is the world’s first demonstration of a 2G HTS device in the electric power grid.
- Established and managed Cooperative Research Agreements with Los Alamos National Laboratory, Oak Ridge National Laboratory, Argonne National

Laboratory, and National Renewable Energy Laboratory and collaborations with Naval Research Laboratory, Air Force Research Laboratory, NIST, and Brookhaven National Laboratory.

- Established and managed research agreements with U. Florida, U. Albany, Cambridge University, Ohio State University, Florida State University, University of Wisconsin, Rensselaer Polytechnic Institute, and Colorado State University

Management

- Managed a team of 42 scientists, engineers, and technicians (80% of all company staff)
- Managed a \$ 11 M/year budget (\$ 8.5 M for R&D and \$ 2.5 M for Capital Equipment)
- Managed five externally funded programs with DOE, Air Force Research Laboratory, AFOSR, Title III Office at an annual funding level of \$ 5.5 M.
- Managing Cooperative Research & Development Agreements with four National Laboratories at an annual budget of \$ 3 M.
- Managed Research Agreements with five Universities at an annual budget of approximately \$ 300 k.
- Created, and Managing a Technology Roadmap for SuperPower
- Managed Intellectual Property Portfolio of SuperPower

Funds Procurement

- Directly procured over \$ 21 M in during 1998 - 2008 years for 20 research projects and \$ 17 M in during 2003 - 2008 years for 10 research projects from external funding agencies such as Department of Energy, Air Force Research Laboratory, Title III Office, Dual Use Science & Technology program, Air Force Office of Scientific Research, and the New York State Energy Research & Development Authority.

Professional Services

- Member of Organizing Committee of the Materials Research Society International Workshop on HTS, Gatlinburg, 2002, Materials Science & Technology (MS&T) Conference, Cincinnati, 2006, Applied Superconductivity Conference, Houston, 2002, , International workshop on Coated Conductor for Applications, Houston, 2008, International workshop on Coated Conductor for Applications, Dresden, Germany, 2006, International workshop on Coated Conductor for Applications, Orta S. Giulio, Italy, 2003, ISTECS-MRS International Workshop on HTS, Honolulu, 2001, U.S. Department of Energy Wire Development Workshops, St. Petersburg, 2000 – 2007 (all 7 years the workshop was held).
- Reviewer of IEEE Transactions, Superconductor Science and Technology, Journal of Materials Research, Physica C.

- Mentored Burnt Hills High School student Olivia Partyka for 2 years enabling her to become a finalist in the nationally renowned Intel Science & Technology Competition.
- One of nine international panelists to choose the 2005 & 2006 Superconductivity Industry Person of the year
- Reviewer of proposals for NYSERDA, DOE
- Chaired sessions in numerous conferences and workshops organized by MRS, TMS, ACerS, ECS, ISS, DOE, ASC and AFOSR.

Publications (published)

1. V. Selvamanickam, Y. Chen, X. Xiong, Y. Xie, X. Zhang, A. Rar, M. Martchevskii, R. Schmidt, K. Lenseth, J. Herrin, "Progress in Second-generation HTS Wire Development and Manufacturing" *Physica C*. **468**, 1504 (2008)
2. O. Polat, T. Aytug, M. Paranthaman, K. Kim,, Y. Zhang, J.R. Thompson, D.K. Christen, X. Xiong, and V. Selvamanickam, "Direct growth of LaMnO₃ cap buffer layers on IBAD-MgO for simplified template-based YBCO coated conductors", *J. Mater. Res.* **23**, 3021 (2008)
3. L. Stan, T. G. Holesinger, B. Maiorov, Y. Chen, D M Feldmann, O. Usov, R F. DePaula, V. Selvamanickam, L. Civale, S.R. Foltyn and Q. X. Jia, "Structural and superconducting properties of (Y, Gd)Ba₂Cu₃O_{7-δ} grown by MOCVD on samarium zirconate buffered IBAD-MgO", *Supercond. Sci. Technol.* **21**, 105023 (2008)
4. M. Sugano, S. Choi, A. Miyazoe, K. Miyamatsu, T. Ando, K. Itoh, T. Kiyoshi, H. Wada, and V. Selvamanickam, "Strain analysis of Ic characteristic of YBCO coated conductor measured by a Walters Srping, " *IEEE Trans. Appl. Supercond.* **18**, 1143 (2008)
5. V. Selvamanickam, Y. Chen, X. Xiong, Y. Xie, X. Zhang, Y. Qiao, J. Reeves, A. Rar, R. Schmidt and K. Lenseth, "Progress in scale-up of second-generation HTS conductor", *Physica C*, **463-465**, pp. 482-487 (2007)
6. R.C. Duckworth, F.A. List III, M.P. Paranthaman, M.W. Rupich, W. Zhang, Y.Y. Xie and V. Selvamanickam, "Low ac loss geometries in YBCO coated conductors", *Physica C* **463-465**, pp. 755 - 760 (2007)
7. Z. Chen, D. M. Feldmann, X. Song, S. I. Kim, A. Gurevich, J. L. Reeves, Y. Y. Xie, V. Selvamanickam and D. C. Larbalestier, "Three-dimensional vortex pinning by nano-precipitates in a Sm-doped YBa₂Cu₃O_{7-x} coated conductor", *Supercond. Sci. Technol.* **20**. S205-S210 (2007)
8. V. Selvamanickam, Y. Chen, X. Xiong, Y.Y. Xie, J.L. Reeves, X. Zhang, Y. Qiao, K.P. Lenseth,, R.M. Schmidt, A. Rar, D. W. Hazelton, and K. Tekletsadik, "Recent Progress in Second-Generation HTS Conductor Scale-Up at SuperPower", *IEEE Trans. Appl. Supercond.* **17**, 3231 (2007) **Paper was rated Outstanding by all 3 reviewers.**
9. Y.Y. Xie, K. Tekletsadik, D. Hazelton and V. Selvamanickam, "2nd Generation High-Temperature Superconducting Wires for Fault Current Limiter Applications", *IEEE Trans. Appl. Supercond.* **17**, 1981 (2007)
10. X. Xiong, K. P. Lenseth, J. L. Reeves, Y. Qiao, R. M. Schmidt, Y. Chen, Y. Li, Y. Xie, V. Selvamanickam, "High Throughput Processing of Long-Length IBAD MgO and Epi-Buffer Templates", *IEEE Trans. Appl. Supercond.* **17**, 3375 (2007)

11. L.C. Leu, D. P. Norton, G. E. Jellison, Jr., V. Selvamanickam, and X. Xiong, "Optical and Dielectric Properties of CuAl_2O_4 ", *Thin Solid Films* **515**, 6938 (2007)
12. X. Song, Z. Chen, S. Kim, D. M. Feldmann, D. Larbalestier, J. Reeves, Y. Xie, V. Selvamanickam, "Evidence for enhanced flux-pinning by small, dense nanoprecipitates in a Sm-doped $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ coated conductor", *Appl. Phys. Lett.* **88**, 212508 (2006)
13. D. W. Hazelton, Y. Xie, Y. Qiao, X. Zhang, V. Selvamanickam, "SuperPower's second-generation HTS Conductor Design for Stability and Low ac Losses", *Adv. in Cryogenic Eng.*, Vol. 52A, 859, (2006).
14. S. J. Park, D. Norton, and V. Selvamanickam, "Formation of Biaxial Texture in Metal Films by Selective Ion Beam Etching", *Appl. Surf. Sci.* **252**, p. 5197-5206 (2006).
15. V. Selvamanickam, A. Knoll, Y. Xie, Y. Li, Y. Chen, J. Reeves, X. Xiong, Y. Qiao, T. Salagaj, K. Lenseth, D. Hazelton, C. Reis, H. Yumura, and C. Weber, "Scale-up of Applications-ready Practical Y-Ba-Cu-O Coated Conductors," *IEEE Trans. Appl. Supercond.* **15**, pp. 2596- 2499 (2005)
16. Y. Li, J. Reeves, X. Xiong, Y. Qiao, Y. Xie, P. Hou, A. Knoll, K. Lenseth, and V. Selvamanickam, "Fast Growth Process of Long-length YBCO Coated Conductor with High Current Density," *IEEE Trans. Appl. Supercond.* **15**, pp. 2771- 2774 (2005)
17. N. Cheggour, J. W. Ekin, C. L. H Thieme, Y. Y. Xie, V. Selvamanickam, and R. Feenstra, "Reversible axial strain effect in coated conductors", *Supercond. Sci. Technol.* **18**, S319-S324 (2005)
18. Y. Iwasa, J. Jankowski, S. Hahn, H. Lee, J. Bascunan, J. Reeves, A. Knoll, Y. Xie, and V. Selvamanickam, "Stability and Quench Protection of Coated YBCO Composite Tape", *IEEE Trans. Appl. Supercond.* **15**, pp. 1683-1686 (2005)
19. N. Cheggour, J. W. Ekin, Y. -Y. Xie, V. Selvamanickam, C. L. H Thieme and D. T. Verebelyi, "Enhancement of the irreversible axial-strain limit of Y Ba-Cu-O coated conductors with the addition of a Cu stabilizer", *Appl. Phys. Lett.* **87**, 212505 (2005)
20. Y.-Y. Xie, A. Knoll, Y. Chen, Y. Li, X. Xiong, Y. Qiao, P. Hou, J. Reeves, T. Salagaj, K. Lenseth, L. Civale, B. Maiorov, Y. Iwasa, V. Solovyov, M. Suenaga, N. Cheggour, C. Clickner, J.W. Ekin, C. Weber, and V. Selvamanickam, "Progress in Scale-Up of Second-Generation High-Temperature Superconductors at Superpower" *Physica C.* **426-431**, pp. 849-857 (2005)
21. S. J. Park, D. Norton, and V. Selvamanickam, "Ion Beam Texturing of Uniaxially-textured Nickel Films", *Appl. Phys. Lett.* **87**, 031907 (2005).

22. V. Selvamanickam, H. G. Lee, X. Xiong, Y. Qiao, Y. Xie, J. Reeves, Y. Li, A. Knoll, and K. Lenseth, "Recent Developments in Scale Up Of High Performance High Temperature Superconductors", *MRS Symp. Proc.* **vol. EXS-3**, p. 29 (2004)
23. V. Selvamanickam, Y. Xie, J. Reeves, and Y. Chen, "MOCVD-Based YBCO-Coated Conductors: Current Status and a Topical Review", *Mater. Res. Soc. Bull.* **29**, 579, (2004)
24. M. S. Hatzistergos, H. Efstathiadis, J. L. Reeves, V. Selvamanickam, L. P. Allen, E. Lifshin and P. Haldar, "Microstructural and compositional analysis of $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ films grown by MOCVD before and after GCIB smoothing", *Physica C.*, **405**, 179 (2004).
25. V. Selvamanickam, Y. Li, H. G. Lee, X. Xiong, Y. Qiao, J. Reeves, Y. Xie, A. Knoll, and K. Lenseth, "Scale up of High Performance High Temperature Superconductors", in *Fabrication of Long-length and Bulk High Temperature Superconductors*, ed. Meng, Goyal, Wong-Ng, Matsumoto, and Freyhardt, p. 9, The American Ceramic Society, Westerville, (2003)
26. Y.-Y. Xie, A. Knoll, Y. Li, X. Xiong, Y. Qiao, Y. Chen, P. Hou, J. Reeves, T. Salagaj, K. Lenseth, C. Weber, and V. Selvamanickam, "Progress towards Application Readiness of Coated Conductors at SuperPower", *Proc. Intl. Workshop on Coated Conductors for Applications*, Oct. 31 – Nov. 2, Kanagawa, Japan (2004)
27. V. Selvamanickam, H. G. Lee, X. Xiong, Y. Qiao, Y. Xie, J. Reeves, A. Knoll, Y. Li, K. Lenseth, and R. Schmidt, "Scale Up of Y-Ba-Cu-O Superconducting Tapes using Ion Beam Assisted Deposition and Metal Organic Chemical Vapor Deposition", *Epitaxial Growth of Functional Oxides*, ed. A. Goyal, Y. Kuo, O. Leonte, and W. Wong-Ng, p. 263, *Proc. 202nd Electrochemical Society mtg.*, Orlando , FL , Oct. 11-17, (2003) .
28. V. Selvamanickam, H.G. Lee, Y. Li, X. Xiong, Y. Qiao, J. Reeves, Y. Xie, A. Knoll, and K. Lenseth, "Fabrication of 100 A class, 1 m long coated conductor tapes by metal organic chemical vapor deposition and pulsed laser deposition", *Physica C.* **392-396**, pp. 859-862 (2003)
29. M. S. Hatzistergos, H. Efstathiadis, E. Lifshin, A. Kaloyeros, J. L. Reeves, V. Selvamanickam, L. Allen, and R. MacCrimmon, "Microstructural and electrical characterization of gas cluster ion beam-smoothed YBCO films", *IEEE Trans. Appl. Supercond.* **13**, pp. 2470- 2473 (2003)
30. V. Selvamanickam, H.-G.Lee, Y. Li, J. Reeves, Y. Qiao, Y.Y. Xie, K. Lenseth, G. Carota, M. Funk, K. Zdun, J. Xie, K. Likes, M. Jones, L. Hope, and D. W. Hazelton, "Scale up of high-performance Y-Ba-Cu-O coated conductors", *IEEE Trans. Appl. Supercond.* **13**, pp. 2492- 2495 (2003)
31. Y. Li, K. Zdun, L. Hope, J. Xie, S. Corcoran, Y. Qiao, J. Reeves, K. Lenseth, and V. Selvamanickam, "Texture development and superconducting properties of

- YBCO thick films deposited on buffered metal substrates at various deposition rates”, *IEEE Trans. Appl. Supercond* **13**, pp. 2758- 2761 (2003).
32. V. Selvamanickam, H. G. Lee, Y. Xie, X. Xiong, Y. Qiao, Y. Li, J. Reeves, and A. Knoll, “High Performance Coated Conductors using MOCVD”, *Proc. Intl. Workshop on Coated Conductors for Applications*, Sep. 12 – 13, Orta S. Giulio, Italy (2003)
 33. Y. Qiao, Y. Li, S. Sathiraju, J. Reeves, K. Lenseth, V. Selvamanickam, “An overview of the coated conductor progress at IGC-SuperPower”, *Physica C* **382**, pp. 48 -51 (2002)
 34. V. Selvamanickam, Y. Li, S. Sathiaraju, Y. Qiao, K. Zdun, L. Hope, J. Reeves, K. Lenseth, and P. Haldar, “Coated Conductor Scale-up Program at IGC-SuperPower” *AIP Conf. Proc.* **608**, 1163 (2002)
 35. V. Selvamanickam et al., “High-Current Y-Ba-Cu-O Coated Conductor using Metal Organic Chemical-Vapor Deposition and Ion-Beam-Assisted Deposition”, *IEEE Trans. Appl. Supercond.***11**, 3379, (2001)
 36. M. Lelovic, R. Koritala, B. Fisher, U. Balachandran, N. Vo, V. Selvamanickam, and P. Haldar, *IEEE Trans. Appl. Supercond.***11**, 3349, (2001)
 37. U. K. Sinha, D. T. Lindsay, R. L. Hughey, J. P. Stovall, M. J. Gouge, J. W. Lue, P. Haldar, V. Selvamanickam, and N. Vo, *IEEE Power Eng. Soc. Winter Mtg.* **2**, 442 (2001)
 38. V. Selvamanickam et al., “High-current Y-Ba-Cu-O superconducting films by metal organic chemical vapor deposition on flexible metal substrates”, *Physica C*: **333**, pp. 155-162 (2000).
 39. L. Zhang, M. Mironova, V. Selvamanickam and K. Salama, “Study of Ag/BSCCO interface in Ag-sheathed multifilament Bi-2223 tapes”, *Physica C*. **341**, 1471 (2000)
 40. V. Selvamanickam, G. Galinski, J. DeFrank, C. Trautwein, P. Haldar, U. Balachandran, M. Lanagan, and M. Chudzik, “Y-Ba-Cu-O Film Deposition by Metal Organic Chemical Vapor Deposition on Buffered Metal Substrates “, *IEEE Trans. Appl. Supercond.* **9**, 1523, (1999).
 41. L.R. Motowidlo, V. Selvamanickam, G. Galinski, N. Vo, P. Haldar, and R.S. Sokolowski, “Recent progress in high-temperature superconductors at Intermagnetics General Corporation”, *Physica C.*, **335**, pp. 44-50 (2000)
 42. U. Balachandran, M. Lelovic, B. C. Prorok, N. G. Eror, V. Selvamanickam, and P. Haldar, “Advances in Fabrication of Ag-clad Bi-2223 superconductors”, *IEEE Trans. Appl. Supercond.* **9**, 2474, (1999).
 43. U. Balachandran, M. Lelovic, B. C. Prorok, V. Selvamanickam, and P. Haldar, “Fabrication and Characterization of Ag-Clad Bi-2223 Tapes”, *Proc. 101st Annual Mtg. of Am. Ceram. Soc.* Indianapolis, April 22-24, (1999).

44. V. Selvamanickam, D. W. Hazelton, L. Motowidlo, F. Krahula, J. Hoehn Jr., M. S. Walker, and P. Haldar, "Development of High Temperature Superconducting Conductors for Electric Power and High Energy Physics Applications", *JOM Special Issue on HTS*, **50**, pp. 27 - 30 (1998).
45. M. Lelovic, N. G. Eror, U. Balachandran, B. Prorok, V. Selvamanickam, P. Haldar, J. Talvacchio, and R. Young, "Shielded High- T_c , $(\text{Bi,Pb})_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y$ (Bi-2223) Superconducting Tapes", *Supercond. Sci. & Technol.* **11**, pp. 1255 – 1260 (1998).
46. V. Selvamanickam, A. Ivanova, D. B. Fenner, T. Thurston, M. S. Walker, A. E. Kaloyeros, and P. Haldar, "Fabrication of Biaxially-textured thick film Y-Ba-Cu-O Superconductor by MOCVD on cube-textured metal substrates", *High Temperature Superconductors : Synthesis, Processing, and Large-Scale Applications II*, ed. U. Balachandran and P. J. McGinn, p.165, TMS Publication, Warrendale, PA, (1997).
47. U. Balachandran, V. Selvamanickam, P. Haldar, M. Lelovic, and N. G. Eror, 'Development of Ag-Clad Bi-2223 Superconductors for Electric Power Applications', *Supercond. Sci. & Technol.* **10**, 978, (1998).
48. V. Selvamanickam, D. Kirchoff, C. E. Oberly, K. Salama, Y. Zhang, and S. Salib, "Growth Kinetics and Processing Time Reduction in Melt-texturing of Y-Ba-Cu-O Superconductor", *High Temperature Superconductors : Synthesis, Processing, and Large-Scale Applications II*, ed. U. Balachandran and P. J. McGinn, p.117, TMS Publication, Warrendale, PA, 1997.
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Book Chapter

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2. T. Aytug, M. Paranthaman, L. Heatherly, Y. Zhang, K.Kim, and A. Goyal, V. A. Maroni, Y. Chen, V. Selvamanickam, "Deposition studies and coordinated characterization of MOCVD YBCO films for coated conductors", *Supercond. Sci. Technol.* (submitted)
3. X. Xiong, S. Kim, K. Zdun, S. Sambandam, A. Rar, K. P. Lenseth and V. Selvamanickam, "Progress in High Throughput Processing of Long-Length, High quality and Low Cost IBAD MgO and Buffer Tapes at SuperPower " *IEEE Trans. Appl. Supercond.* (to be published)
4. Y. Chen and V. Selvamanickam, "Progress in Fabricating Second Generation HTS Wire with MOCVD Based Process" *J. Mat. Research* (submitted)
5. G. Majkic, R. J. Mensah, V. Selvamanickam, Y. Xie and K. Salama, "Electromechanical Behavior of IBAD/MOCVD YBCO Coated Conductors Subjected to Twist and Tension Loading Second-generation HTS Conductor Design and Engineering for Electrical Power Applications" *IEEE Trans. Appl. Supercond.* (to be published)

6. Y. Xie, M. Marchevsky, X. Zhang, K. Lenseth, Y. Chen, X. Xiong, Y. Qiao, A. Rar, B. Gogia, R. Schmidt, A. Knoll, V. Selvamanickam, and G. Pethuraja and P. Dutta, "Second-generation HTS conductor design and engineering for electrical power applications", *IEEE Trans. Appl. Supercond.* (to be published)
7. R. J. Mensah, G. Majkic, Y. Chen, V. Selvamanickam, P. Putman, and K. Salama, "Effect of Mn Addition on In-Field Behavior of IBAD/MOCVD Gd-YBCO Doped Coated Conductors", *IEEE Trans. Appl. Supercond.* (to be published)
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9. A. Bayou, G. Majkic, Y.X. Zhou, V. Selvamanickam, Y.Y. Xie and K. Salama, "Effect of transverse pull loading on electromechanical properties of 2nd generation HTS wires" *Supercond. Sci. Technol* (to be published)
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Issued Patents

1. **U.S. 7,417,192**, *"Superconductor components"*
2. **U.S. 7,387,811**, *"Method for manufacturing superconducting conductors by Chemical Vapor Deposition"*
3. **U.S. 7,365,271**, *"Novel superconducting articles, and methods of forming and using same"*
4. **U.S. 7,338,683**, *"Superconductor Fabrication Processes"*
5. **U.S. 7,286,032**, *"Rare-earth-Ba-Cu-O superconductors and methods of making same"*
6. **U.S. 7,247,340**, *"Method of making a superconductor conductor"*
7. **U.S. 7,226,893**, *"Superconductive articles having density characteristics"*
8. **U.S. 7,074,744**, *"Apparatus for consecutive deposition of HTS buffer layers"*
9. **U.S. 7,071,149**, *"Method for producing biaxially textured buffer layers and related articles, devices and systems"*
10. **U.S. 7,071,148**, *"Joined superconductive articles"*
11. **U.S. 7,025,826**, *"Methods for surface texturing amorphous films"*
12. **U.S. 6,998,028**, *"Methods for forming superconducting conductors"*
13. **U.S. 6,908,362**, *"Reel-to-reel substrate Tape polishing process"*
14. **U.S. 6,906,008**, *"Apparatus for consecutive deposition of HTS buffer layers"*
15. **U.S. 6,849,580**, *"Method of producing biaxially textured buffer layers and related articles, devices and systems"*
16. **U.S. 5,846,912**. *'Method for preparation of textured YBa₂Cu₃O_x superconductor'*
17. **U. S. 5,462,917**, *'Process of preparing superconductive oxide complexes containing L, Ba, Cu, and O and method of using the same'*,
18. **U. S. 5,439,879**, *'Method for joining superconductor segments to form a superconducting article'*
19. **U.S. 5,306,697**, *'Oriented grained Y-Ba-Cu-O superconductors'*
20. **U.S. 4,956,336**, *'Oriented-grained Y-Ba-Cu-O superconductors having high critical currents and method for producing same'*
21. **Korean 54,4561** *"Coated HTS tapes, articles, and processes for forming same"*

U.S. Patents Pending

#	Patent Application	Title
1	10/610,072	Coated HTS tapes, articles, and processes for forming same
2	10/609,250	Apparatus for and method of continuous HTS tape buffer layer deposition using large scale ion beam assisted deposition
3	11/287,770	Methods for forming superconducting conductors
4	10/602,467	High Throughput Ion Beam Assisted Deposition (IBAD)
5	10/609,236	Apparatus for and method of cooling and positioning a translating substrate tape for use with a continuous vapor deposition process
6	10/602,294	High throughput continuous PLD process & apparatus
7	10/816,045	Superconductor fabrication process (Substrate polishing and cleaning)
8	10/701,192	A Tape-manufacturing system having extended operational capabilities
9	10/602,468	MOCVD process and apparatus to produce multi-layer HTS coated tape
10	10/456,733	Ion beam-assisted HTS deposition for thick film tape
11	10/736,223	High-throughput ex-situ method for rare-earth-barium-copper-oxide (REBCO) film growth
12	10/456,732	Ultraviolet (UV) and plasma assisted metalorganic chemical vapor deposition (MOCVD) system
13	10/736,210	Chemical Vapor Deposition process using novel precursors
14	10/821,010	Biaxially textured film deposition for superconductor coated tapes
15	11/324,511	A Chemical Vapor Deposition (CVD) apparatus usable in the manufacture of superconducting conductors (MOCVD Showerhead)
16	11/326,895	A Chemical Vapor Deposition (CVD) apparatus usable in the manufacture of superconducting conductors (Liquid precursor supply)
17	11/233,389	Superconductor fabrication processes (Round coated conductor wire)
18	10/950,189	Critical current testing techniques for superconducting conductors
19	11/319,971	Anti-epitaxial film in a superconducting article and related articles, devices and systems
20	11/320,104	A Superconducting article and method of forming a superconducting article (Buffer growth on crystalline seed layers)
21	11/319,972	Method of facilitating superconducting tape manufacturing (Test techniques for 2G tape)
22	11/487,204	Method of forming a multifilament AC tolerant conductor with striated stabilizer, articles related to the same, and devices incorporating same
23	11/558,518	Ni-Cr binary alloys as substitute for Hastelloy C276
24	12/033,660	Minimization of Silver in HTS Conductor
25	12/128,376	High throughput method to produce multifilamentary REBCO conductors

International Patents Pending

#	Country	Patent Application	Title
1	European Union	01 927 476.0	Coated HTS tapes, articles, and processes for forming same
2	Japan	2002-556976	Coated HTS tapes, articles, and processes for forming same
3	Japan	2002-569346	Reel-to-reel substrate Tape polishing process
4	Canada	2529373	MOCVD process and apparatus to produce multi-layer HTS coated tape
5	China	200480017515.7	MOCVD process and apparatus to produce multi-layer HTS coated tape
6	European Union	04 821 532.1	MOCVD process and apparatus to produce multi-layer HTS coated tape
7	India	3489/CHENP/2005	MOCVD process and apparatus to produce multi-layer HTS coated tape
8	Japan	2006-517153	MOCVD process and apparatus to produce multi-layer HTS coated tape
9	Korea	10-2005-7024748	MOCVD process and apparatus to produce multi-layer HTS coated tape
10	Canada	2,527,870	Ion beam-assisted HTS deposition for thick film tape
11	China	2004-80015467.8	Ion beam-assisted HTS deposition for thick film tape
12	European Union	04 776 126.7	Ion beam-assisted HTS deposition for thick film tape
13	India	3259/CHENP/2005	Ion beam-assisted HTS deposition for thick film tape
14	Japan	2006-514975	Ion beam-assisted HTS deposition for thick film tape
15	Korea	10-2005-7023345	Ion beam-assisted HTS deposition for thick film tape
16	Canada	CN 2004 80037018.3	High-throughput ex-situ method for rare-earth-barium-copper-oxide (REBCO) film growth
17	China	2004 80037018.3	High-throughput ex-situ method for rare-earth-barium-copper-oxide (REBCO) film growth
18	European Union	04 818 009.5	High-throughput ex-situ method for rare-earth-barium-copper-oxide (REBCO) film growth
19	India	2113/CHENP/2006	High-throughput ex-situ method for rare-earth-barium-copper-oxide (REBCO) film growth
20	Japan		High-throughput ex-situ method for rare-earth-barium-copper-oxide (REBCO) film growth
21	Korea	10-2006-7011832	High-throughput ex-situ method for rare-earth-barium-copper-oxide (REBCO) film growth
22	Canada	2,527,732	Ultraviolet (UV) and plasma assisted metalorganic chemical vapor deposition (MOCVD) system
23	China	2004-80015474.8	Ultraviolet (UV) and plasma assisted metalorganic chemical vapor deposition (MOCVD) system
24	European Union	04 753 466.4	Ultraviolet (UV) and plasma assisted metalorganic chemical vapor deposition (MOCVD) system
25	India	3256/CHENP/2005	Ultraviolet (UV) and plasma assisted metalorganic chemical vapor deposition (MOCVD) system
26	Japan	2006-514976	Ultraviolet (UV) and plasma assisted metalorganic chemical vapor deposition (MOCVD) system
27	Korea	10-2005-7023341	Ultraviolet (UV) and plasma assisted metalorganic chemical vapor deposition (MOCVD) system
28	Canada	2,528,949	Method of producing biaxially textured buffer layers and related articles, devices and systems
29	China	200480022814.X	Method of producing biaxially textured buffer layers and related articles, devices and systems
30	European Union	04801958.2	Method of producing biaxially textured buffer layers and related articles, devices and systems
31	India		Method of producing biaxially textured buffer layers and related articles, devices and systems
32	Japan		Method of producing biaxially textured buffer layers and related articles, devices and systems
33	Korea	2005-7023764	Method of producing biaxially textured buffer layers and related articles, devices and systems
34	Canada	2560771	Biaxially textured film deposition for superconductor coated tapes
35	China	200580012039.4	Biaxially textured film deposition for superconductor coated tapes
36	European Union	5856601.9	Biaxially textured film deposition for superconductor coated tapes
37	India	3728/CHENP/2006	Biaxially textured film deposition for superconductor coated tapes
38	Japan	2007-507513	Biaxially textured film deposition for superconductor coated tapes
39	Korea	10-2006-7020957	Biaxially textured film deposition for superconductor coated tapes
40	Canada	2,550,395	Novel superconducting articles, and methods of forming an dusing same
41	China	2004 80038151.0	Novel superconducting articles, and methods of forming an dusing same
42	European Union	04 821 658.4	Novel superconducting articles, and methods of forming an dusing same
43	India	2413/CHENP/2006	Novel superconducting articles, and methods of forming an dusing same
44	Japan	2006-547111	Novel superconducting articles, and methods of forming an dusing same
45	Korea	10-2006-7012006	Novel superconducting articles, and methods of forming an dusing same
46	Canada		Superconductive articles having density characteristics
47	China	200680005507.X	Superconductive articles having density characteristics
48	European Union	EP 06720951.0	Superconductive articles having density characteristics
49	Korea	10-2007-7019282	Superconductive articles having density characteristics
50	Japan	2007-557105	Superconductive articles having density characteristics
51	India	3679/CHENP/2007	Superconductive articles having density characteristics
52	Canada	2603768.0	Joined Superconductive Articles
53	China	2.00068E+12	Joined Superconductive Articles
54	European Union	EP 6749634.9-1214	Joined Superconductive Articles
55	Korea	10-2007-7025925	Joined Superconductive Articles
56	Japan	2008-505622	Joined Superconductive Articles
57	India		Joined Superconductive Articles
58	European Union	1966837	Anti-epitaxial film in a superconducting article and related articles, devices and systems
59	Korea	10-2008-7018546	Anti-epitaxial film in a superconducting article and related articles, devices and systems
60	Japan		Anti-epitaxial film in a superconducting article and related articles, devices and systems