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Center for the Space Processing of Engineering Materials

Final Technical Report

Principal Investigator: J.L. Davidson

Period of Performance: September 15, 1985-March 31, 1993

**Vanderbilt University
Division of Sponsored Research
512 Kirkland Hall
Nashville, TN 37240**

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Materials Presentations and Publications
Resulting from NAGW-810

G.J. Abbaschian. "Solidification of Nb-Based Alloys." Presented at the TMS Annual Meeting, Denver, CO, Feb. 26, 1987.

C.D. Anderson, W.H. Hofmeister, J.E. Wittig, R.J. Bayuzick, and D.J. Skinner. "A Microstructural Examination of Ti-50Al and Other Binary Ti-Al Alloys that have been Splat-Quenched after Bulk Undercooling." *Materials Processing in Space* 50, 1989.

C.D. Anderson, R.A. Overfelt, and W.F. Flanagan. "Comparison of Microstructures and Magnetic Properties of Melt Spun and Plasma Sprayed Alloys of Fe-Rare Earth-B." *Mat. Res. Soc. Symp. Proc.* 80: 449-456, 1987.

R.J. Bayuzick. "Microgravity Processing of Metals and Alloys." Presented at the Symposium on Materials Processing in the Reduced Gravity Environment of Space, MRS meeting, Dec. 1-3, 1986.

R.J. Bayuzick. "Space Processing of Metals and Alloys." Presented at the Symposium on Materials Processing in Space at the Golden Gate Materials Technology Conference, San Francisco, CA, Feb. 1987.

G. Carro and W.F. Flanagan. "Effect of Deep Undercooling Followed by Rapid Solidification on the Formability of Nickel Aluminides." Presented at Symposium G of the MRS fall meeting, Boston, MA, Dec. 1986.

G. Carro and W.F. Flanagan. "The Effect of Solidification Rate in the Formability of a Nickel-Aluminide Containing Iron and Boron." *Mat. Res. Soc. Symp. Proc.* 80: 225-230, 1987.

G. Carro and W.F. Flanagan. "Measuring Tensile Properties of Deeply Undercooled and Rapidly Solidified Miniature Samples of Nickel Aluminides." *Scripta Met.* 22: 903-906, 1988.

C.W. Chu, P.H. Hor, R.L. Meng, D.S. Tang, C.Z. Wu, Z.X. Zhao, R.A. Overfelt, and R.J. Bayuzick. "Study of Light Fermion Superconductors $BaPb_{1-x}Bi_xO_3$ Crystals." Presented at Symposium S of the MRS fall meeting, Boston, MA, Dec. 1986.

B.K. Dhindaw, A.S. Kacar and D.M. Stefanescu. "Entrapment/Pushing of Particles During Directional Solidification of Al-Si Carbide Metal Matrix Composites." Presented at the 1st ASM European Technical Conference, Paris, France, Sept. 7-8, 1987.

R.N. Grugel. "Mixed Gravity Mode Growth During Directional Dendritic Solidification Aboard the KC-135." *Metall. Trans. A* 20A: 1284-1286, 1989.

R.N. Grugel and R. Poorman. "Hypermonotectic Alloy Solidification in a Microgravity Environment." *Materials Science Forum* 50: 89-100, 1989.

W.H. Hofmeister. "The Undercooling of High Melting Temperature Pure Metals in a Containerless, Microgravity Environment." Ph.D. Dissertation, Vanderbilt University, Nashville, TN, Feb. 1987.

W.H. Hofmeister and R.J. Bayuzick. "Activities of the Vanderbilt Center for the Space Processing of Engineering Materials." SDIO/IST 3rd Pathways to Space Experimentation Workshop, Orlando, FL, June 1987.

W.H. Hofmeister, R.J. Bayuzick, and M.B. Robinson. "Noncontact Temperature Measurement of a Falling Drop." *Intl. Journal of Thermophysics* 10: 279–292, 1989.

W.H. Hofmeister, R.J. Bayuzick, and M.B. Robinson. "Dual Purpose Pyrometer for Temperature and Solidification Velocity Measurement." *Materials Processing in Space* 50, 1989.

W.H. Hofmeister, M.B. Robinson, and R.J. Bayuzick. "Undercooling of Bulk High Temperature Metals in the 100–Meter Drop Tube." *Mat. Res. Soc. Symp. Proc.* 87: 149–162, 1987.

W.H. Hofmeister, M.B. Robinson, and R.J. Bayuzick. "Undercooling of Pure Metals in a Containerless, Microgravity Environment." *Appl. Phys. Lett.* 49: 1342, 1986.

W.H. Hofmeister and J.W. Williamson. "Containerless Processing of Spherically Shaped Alloys by Coupling Ground Based Levitation Methods." AIAA 26th Aerospace Sciences Meeting, Reno, NV, Jan. 11–14, 1988.

A. Kacar, B.K. Dhindaw, D.M. Stefanescu, and P.A. Curreri. "Interaction Between SiC Particles and Directionally Solidifying Interfaces in Al–Si Carbide Metal Matrix Composites." Presented at the 1st Alabama Materials Research Conference, Birmingham, AL, Sept. 28–30, 1987.

A. Kacar, B.K. Dhindaw, D.M. Stefanescu, and P.A. Curreri. "Directional Solidification of SiC–Al Alloy Composites During Parabolic Trajectories Part I: Single Phase Matrix Al–Mg–SiC Composites." Presented at 2nd Int'l. Symposium on Experimental Methods for Microgravity Materials Science Research, 117th TMS–AIME Annual Meeting, Phoenix, AZ, Jan. 25–29, 1988.

C.S. Kanetkar, A.S. Kacar and D.M. Stefanescu. "The Wetting Characteristics and Surface Tension of Some Ni–Based Alloys on Ytria, Hafnia, Alumina and Zirconia Substrates." *Metall. Trans. A* 19A: 1833–1839, 1988.

D.R. Kegley, Jr., J.E. Wittig, W.H. Hofmeister, R.J. Bayuzick, and R.G. Rowe. "Effect of Bulk Undercooling on the Structure of Rapidly Solidified Titanium–4 wt% Cerium." *Materials Processing in Space* 50: 129–136, 1989.

B.D. Lichter. "Corrosion of Pb, Pb–Ca–Sn, and Cu–Pb Alloys in Sulfuric Acid. Presented at the 10th Int'l. Congress on Metallic Corrosion, Madras, India, Nov. 1987.

R.A. Overfelt. "An Overview of the Research Projects in Vanderbilt's Center for the Space Processing of Engineering Materials." Presented to the Middle Tennessee Chapter of the American Society for Metals, Oct. 21, 1986.

R.A. Overfelt, C.D. Anderson, and W.F. Flanagan. "Plasma Sprayed Fe₇₆Nd₁₆B₈ Permanent Magnets." *Appl. Phys. Lett.*, 49: 1799–1801, 1986.

C. Rushing, T. Overfelt, and J. Williamson. "Fluid Damping in Directional Solidification Experiments on NASA's KC-135 Aircraft." *Proceedings of the 7th European Symposium on Materials and Fluid Sciences in Microgravity*, 1989.

S. Shah, R.N. Grugel, and B.D. Lichter. "Directional Solidification of Lead-Copper Immiscible Alloys in a Cyclic Gravity Environment." *Metall. Trans. A* 19A: 2677-2680, 1988.

S. Shah and B.D. Lichter. "Corrosion Behavior of Lead Alloys Used for Battery Grids." Presented at the NACE Corrosion '87 conference, San Francisco, CA, March 9-13, 1987.

S. Shah and B.D. Lichter. "Electrochemical Properties of Pure Lead and Lead-Calcium-Tin Alloy Used as Grid Material for Lead-Acid Batteries." Presented at the 1986 fall meeting of TMS, Orlando, FL, Oct. 7, 1986.

S. Shah, B.D. Lichter and V. Dantam. "Electrochemical Behavior of Lead Alloys in Sulfuric Acid." *Bulletin Electrochem.* 3: 565-575, 1987.

D.M. Stefanescu, B.K. Dhindaw, A.S. Kacar and A. Moitra. "Behavior of Ceramic Particles at the Solid-Liquid Metal Interface in Metal Matrix Composites." *Metall. Trans. A* 19A: 2847-2855, 1988.

D.M. Stefanescu, A. Moitra, A.S. Kacar and B.K. Dhindaw. "The Influence of Buoyant Forces and Volume Fraction of Particles on the Particle Pushing/Entrapment Transition during Directional Solidification of Al/SiC and Al/Graphite Composites." *Metall. Trans. A* 21A: 231-239, 1990.

J.T. Teubert and R.A. Overfelt. "Intrinsic Coercivities of Rapidly Solidified Alloys of Pt-Co- B." Presented at the 4th Joint MMM-Intermag Conference in Vancouver, B.C., July 12-15, 1988.

M.W. Wells and R.A. Overfelt. "Development of a Very High Temperature Directional Solidification Furnace." Presented at the AIAA 26th Aerospace Sciences Meeting, Reno, NV, Jan. 11-14, 1988.

G. Whoriskey, R.J. Bayuzick, and W.F. Hofmeister. "Undercooling and Rapid Solidification of Binary Alloys of Niobium." Presented at the AIAA 25th Aerospace Sciences Meeting, Reno, NV, Jan. 12-15, 1987.

J.E. Wittig, D.R. Kegley, Jr., W.H. Hofmeister, and R.J. Bayuzick. "Observation of Cerium-Oxides in Rapidly Solidified Ti-4wt% Ce." *Proceedings of the 47th Annual Meeting of the Electron Microscopy Society of America* 506-507, 1989.