

COST 526 - 'Automatic Process Optimization in Materials Technology' – (APOMAT)
Final Report – 31 July 2005
Summary sheet

Project Code	CZ 1
Title	A numerically based optimization of a near-gamma TiAl precision casting process
Project Leader	Antonin Dlouhy
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Main collaborators involved	Katerina Docekalova, Robert Valek

Funding Situation (for the whole project)

Amount of money received specifically for COST	49.2 kEuros
Other resources partially used for the project	70.2 kEuros

International Collaboration (mention group and type of work done in collaboration during the whole project)

Flowserve, Dayton OH, USA - fabrication of primary TiAl ingots
 Department of Materials Science, RU Bochum, Germany - microstructural analysis of cast parts

Industry participation (mention name of companies and work done in collaboration during the whole project)

PBS Turbo Limited, Velka Bites, CR - shell mould fabrication, tensile tests of the cast TiAl alloys

Meetings, visits, exchange of scientists, short term scientific missions (mention main events during the whole project)

Gamma Titanium Aluminides 2003, TMS 2003 Annual Meeting

First Invited COST 526 Conference

Location, date

San Diego, California, 2-6.3.2003

Morschach, Switzerland, 30-31.5.2005

Main Outcome of the project (mention only the major points)

- The 1D - 1D model of heat flow, thermal expansion mismatch and creep in the system consisting of TiAl cast and ceramic shell mould was formulated and numerically solved.
- The objective function representing the maximum tensile mismatch stress in the cast was minimized with respect to influential process parameters.
- The optimized parameters delimited a processing window suitable for the production of relatively cheap TiAl cast components.

Publications, related to this project

Published

- [1] A. Dlouhý, L. Zemčík, R. Válek: Near-gamma TiAl Investment Casting and Its Optimization, in: Gamma Titanium Aluminides 2003, edited by Y.-W. Kim, H. Clements and A.H. Rosenberger, TMS, Warrendale 2004, 291-296, ISBN 0-87339-543-3.
- [2] A. Dlouhý, L. Zemčík: Precision Casting of Gamma TiAl Alloys and Its Optimization, Slévárenství 52 (6), 2004, 227-232.
- [3] L. Zemčík, A. Dlouhý: Melting of TiAl-based Intermetallic Alloys in Vacuum Induction Furnaces, Slévárenství 52 (6), 2004, 223-226.
- [4] L. Zemčík, A. Dlouhý, S. Malec: Processing of Gamma TiAl Intermetallic Castings, in: Proceedings of 2nd International Conference & Exhibition on New Developments in Metallurgical Process Technology, Associazione Italiana di Metallurgia, Milano 2004, 1-9, ISBN 88-85298-51-6.
- [5] A. Dlouhý, L. Zemčík: Investment Casting Technology Tailored to Near-Gamma TiAl Alloys, in: Automatic Process Optimization in Materials Technology, Proceedings of the First Invited COST 526 Conference, Morschach 30-31 May 2005, ed. D. Bueche and N. Hofmann, University of Aargau 2005, 146-154.

Submitted for publication

- [1] K. Dočekalová, R. Válek, L. Zemčík, A. Dlouhý: Gamma TiAl Processing-Microstructure-Properties Relationship, submitted to Juniormat05

In preparation

- [1] A. Dlouhý, K. Dočekalová, L. Zemčík: Vacuum Induction Melting and Precision Casting Technologies Tailored to Near-Gamma TiAl Alloys - THERMEC 2006 invited paper.

Will you continue the actual cooperation with your partners after the end of the action?



Yes



No

Would you participate in a possible "spin-off" action continuing the present one?



Yes



No

Will you continue your present work/collaboration with another European action?



Yes



No