

Curriculum vitae – March 2018

Thorsten Hermann Becker

SENIOR LECTURER AND RESEARCHER IN MATERIALS ENGINEERING

Contact details Room M608A, Mechanical Engineering Building, Joubert Street, Stellenbosch.
Tel 021-8084045
email tbecker@sun.ac.za, b.thorsten@gmail.com
web www.sun.ac.za/mateng

PROFESSIONAL APPOINTMENTS

2014-current **Stellenbosch University – Dep. of Mechanical and Mechatronic Engineering**
Senior Lecturer

Line manager Prof Gerhard Venter, tel +27 21 8083560, email gventer@sun.ac.za

2012-current **University of Cape Town – Department of Mechanical Engineering**
Visiting Lecturer

Line manager Prof Robert Knutsen, tel +27 21 6503172, email rob.knutsen@uct.ac.za

2012-2014 **Stellenbosch University – Dep. of Mechanical and Mechatronic Engineering**
Lecturer

Line manager Prof Anton Basson, tel +27 21 8084250, email ahb@sun.ac.za

TERTIARY EDUCATION

2009-2011 **PhD Mechanical Engineering**
University of Manchester / University of Cape Town (split site study)

2007-2008 **MSc Mechanical Engineering (upgraded to PhD)**
University of Cape Town

2001-2005 **BSc (1st class honors) Mechanical Engineering**
University of Cape Town

PEER REVIEWED JOURNALS

Huchzermeyer, R., **Becker, T. H.** The application of full-field techniques to estimate both tensile and fracture properties: An investigation into modifications to standard sample geometries, *Experimental Techniques*, (accepted).

Anderson, L., Venter, A., Vranken, B., van Humbeeck, J., Becker, T. H. Investigating the residual stress distribution in Selective Laser Melting produced Ti-6Al-4V using neutron diffraction. *Materials Research Proceedings* (accepted).

Ter Haar, G. & **Becker, T.H.** Selective laser melting produced Ti-6Al-4V: Post-process heat treatments to achieve superior tensile properties. *Materials*, 11, 146-171 (2018)

- van Rooyen, M. & **Becker, T. H.** High temperature tensile property measurements using digital image correlation over a non-uniform temperature field. *Journal of Strain Analysis*, 0309324717752029 (2017).
- Barhli, S. M., Saucedo Mora, L., Simpson, C., **Becker, T.H.**, Mostafavi, M., Withers, P.J., Marrow, T.J. Obtaining the J-integral by diffraction-based crack-field strain mapping. *Procedia Struct. Integr.* 2, 2519–2526 (2016).
- Becker, T.H.** & Dimitrov, D. The achievable mechanical properties of SLM produced Maraging Steel 300 components. *Rapid Prototyp. J.*, 22, 487–494 (2016).
- Dimitrov, D., **Becker, T. H.**, Yadroitsev, I. & Booyesen, G. On the impact of different system strategies on the material performance of Selective Laser Melting-manufactured Ti-6Al-4V components. *South African J. Ind. Eng.*, 27, 184–191 (2016).
- Ter Haar, G. M., **Becker, T. H.**, Blaine, D. C. Influence of heat treatments on the microstructure and tensile behaviour of Selective Laser Melting-produced Ti-6Al-4V parts. *South African J. Ind. Eng.* 27, 174–183 (2016).
- Becker, T. H.**, Beck, M. & Scheffer, C. Microstructure and mechanical properties of direct metal laser sintered Ti-6Al-4V. *South African J. Ind. Eng.* 26, 1–10 (2015).
- Becker, T. H.**, van Rooyen, M. & Dimitrov, D. Heat treatment of Ti-6Al-4V produced by lasercusing. *South African J. Ind. Eng.* 26, 93–103 (2015).
- Hindley, M. P., Blaine, D. C., Groenwold, A. & **Becker, T. H.** Failure prediction of full-size reactor components from tensile specimen data on NBG-18 nuclear graphite. *Nucl. Eng. Des.* 284, 1–9 (2015).
- Molteno, M. R. & **Becker, T. H.** Mode I – III Decomposition of the J -integral from DIC Displacement Data. *Strain* 51, 492–503 (2015).
- Hindley, M. P., Groenwold, A. a., Blaine, D. C. & **Becker, T. H.** Optimisation of the link volume for weakest link failure prediction in NBG-18 nuclear graphite. *Nucl. Eng. Des.* 274, 10–19 (2014).
- Dhansay, N. M., Tait, R. & **Becker, T. H.** Fatigue and Fracture Toughness of Ti-6Al-4V Titanium Alloy Manufactured by Selective Laser Melting. *Advanced Materials Research*. 1019, 248–253 (2014).
- Hindley M.P., Mitchell M.N., Erasmus C, McMurtry R., **Becker T.H.**, Blaine DC, Groenwold AA. A numerical stress based approach for predicting failure in NBG-18 nuclear graphite components with verification problems. *Journal of Nuclear Materials*. 436, 175-184 (2014).
- Becker T. H.**, Tait R. B. & Marrow T. J. An approach to calculate the J- integral by digital image correlation. *Fatigue & Fracture of Engineering Materials & Structures*. 35, 971-984 (2012).
- Knowles C., **Becker T. H.**, Tait R. B. Residual stress measurements and Structural Integrity Implications for Selective Laser Melted Ti-6Al-4V. *South African Journal of Industrial Engineering*. 23, 119-129 (2012).
- Becker T. H.**, Marrow T. J., & Tait R. B. An Evaluation of the Double Torsion Technique. *Experimental Mechanics*. 51, 1-16 (2011).
- Becker T. H.**, Marrow T. J. & Tait R. B. Damage, crack growth and fracture characteristics of nuclear grade graphite using the double torsion technique. *Journal of Nuclear Materials*. 414, 32-43 (2011).

CONFERENCE PROCEEDINGS

- Ter Haar, G. M., **Becker, T. H.** SLM-Produced Ti6Al4V: Novel Post-Process Heat Treatments to Achieve Superior Tensile Properties. in Fraunhofer Direct Digital Manufacturing Conference, (accepted).
- Mugwagwa, L., Dimitrov, D., Matope, S. & **Becker, T. H.** A Methodology to Evaluate the Influence of Part Geometry on Residual Stress in SLM. Coma '16 133–139 (2016).
- Dhansay, N. M. & **Becker, T. H.** A comparative review of the mechanical properties of SLM produced Ti-6Al-4V. in 16th International RAPDASA conference (2015).
- Conradie, J., Turner, D. & **Becker, T.H.** Characterising Damage in Structural Materials using Digital Image Correlation and Peridynamics. in 9th South African Conference on Computational and Applied Mechanics (2014).
- Dimitrov, D., **Becker, T.H.**, Bezuidenhout, M. & Hugo, P. From rapid prototyping to rapid manufacturing - an industrial and academic perspective. in 1st International Conference on Progress in Additive Manufacturing (2014).
- Gogo S.P., Skatulla S., **Becker T.H.** Optimisation of the double torsion geometry. 5th International conference on structural engineering, mechanics and computation, South Africa (2013).
- Becker T.H.**, Turner D.Z. "An investigation of the double torsion geometry using peridynamics". Proceedings of the fifth international conference on structural engineering, mechanics and computation, South Africa (2013).
- Becker T.H.**, Rylands T. Seismic margin assessment of pressure boundary components from existing designs calculations". Proceedings of the 22nd international conference on structural mechanics in reactor technology, USA (2013).
- Becker T.H.** & Marrow T.J. Modelling Damage in Nuclear Graphite". International Conference on Fracture 13, China (2013).
- Knowles C., **Becker T.H.**, Tait R.B. The effects of heat treatment on the residual stress levels within Direct Metal Laser Sintered Ti-6Al-4V as measured using the hole-drilling strain gauge method". 13th International RAPDASA Conference, South Africa (2012).

CONFERENCE TALKS

- Ter Haar, G. M., **Becker, T. H.** Selective Laser Melting Produced Ti6Al4V: Novel Annealing strategies to improve ductility, in 18th International RAPDASA conference, South Africa (2017).
- Anderson, L., Venter, A., Vranken, B., van Humbeeck, J., **Becker, T. H.** Residual Stress: The application of diffraction techniques at different scales. in 18th International RAPDASA conference, South Africa (2017).
- van Rooyen, M. & **Becker, T. H.** Characterising Creep Damage Directly from Digital Image Correlation Displacement Data. in 12th International Conference on Advances in Experimental Mechanics, Sheffield, UK (2017).
- Molteno, M. R., **Becker, T. H.** The Equivalent Volume Integral with Improved Resilience to Errors in Crack Front Position. In 14th International Conference on Fracture, Rhodes, Greece (2017).
- Becker, T. H.**, Molteno, M. R. Detection and Elimination of Spurious Results From Digital Image and Volume Correlation Data. in 12th International Conference on Advances in Experimental Mechanics, Sheffield, UK (2017).

- Huchzermeyer, R., **Becker, T. H.** Measuring Mechanical Properties using Digital Image Correlation: Extracting Tensile and Fracture Properties from a Single Sample. in 12th International Conference on Advances in Experimental Mechanics, Sheffield, UK (2017).
- van Rooyen, M. & **Becker, T. H.** Accelerated creep strain measurement using high-temperature digital image correlation. in 11th International Conference on Advances in Experimental Mechanics, Exeter, UK (2016).
- Becker, T. H.**, Naicker, L., Barhli, S. M. & Marrow, T. J. Stress corrosion cracking investigation of FV520B stainless using digital image correlation and the J-integral. in 11th International Conference on Advances in Experimental Mechanics, Exeter, UK (2016).
- Molteno, M. R., **Becker, T. H.** & Marrow, T. J. Experimental validation of the decomposition method on Digital Volume Correlation displacement data. in 11th International Conference on Advances in Experimental Mechanics, Exeter, UK (2016).
- Molteno, M. R. & **Becker, T. H.** Mode I-III Decomposition of the J -integral from Digital Image Correlation Displacement Data. in International Conference on Computational Modelling of Fracture and Failure, Paris, France (2015).
- van Rooyen, M. & **Becker, T. H.** A 3D Digital Image Correlation Method for High Temperature Application. in 10th International Conference on Advances in Experimental Mechanics, Edinburgh, UK (2015).

RESEARCH GRANTS AND EQUIPMENT GRANTS

- 2018-2020 **Powder bed additive manufacturing using Ti-based alloys for biomedical applications: Optimization of mechanical and biocompatibility properties**
- Funding body National Research Fund (South Africa).
Amount ZAR 830 000 anticipated for 2018.
ZAR 830 000 anticipated for 2019.
ZAR 830 000 anticipated for 2020.
- 2018-2020 **Qualification for additive manufactured Ti6Al4V for aerospace and biomedical applications, round 2.**
- Funding body South African Department for Science and Technology (South Africa).
Amount ZAR 809 020 for 2018.
ZAR 1 220 794 anticipated for 2019.
ZAR 1 908 496 anticipated for 2020.
- 2017-2018 **Creep damage characterisation of power plant steels using full field measurement techniques**
- Funding body Newton Fund (UK).
Amount GBP 12 000.
- 2017-2018 **Measuring property degradation of power plant materials**
- Funding body National Research Fund (South Africa).
Amount ZAR 258 000 for 2017.

ZAR 255 000 for 2018.
ZAR 350 000 anticipated for 2019.

2015-2017 **Qualification for additive manufactured Ti6Al4V for aerospace and biomedical applications.**

Funding body South African Department for Science and Technology (South Africa).
Amount ZAR 775 000 for 2017.
ZAR 812 000 for 2016.
ZAR 613 000 for 2015.

2016 **Post-doctoral fellowship.**

Funding body Subcommittee B, Stellenbosch University.
Amount ZAR 180 000.

2015 **KIC travel grant**

Funding body National Research Fund (South Africa).
Amount ZAR 23 136.

2015 **KU Leuven academic exchange program (Nov 2015 to Jan 2016).**

Funding body Stellenbosch University and KU Leuven
Amount Not specified.

2014-2016 **Material performance investigation into energy materials.**

Funding body National Research Fund (South Africa)
Amount ZAR 339 000 for 2016.
ZAR 332 000 for 2015.
ZAR 347 900 for 2014.

2014-2016 **Material degradation management for thermal power plants.**

Funding body THRIP (joint application with UCT, South Africa)
Amount ZAR 140 000 for 2016.
ZAR 150 000 for 2015.
ZAR 143 000 for 2014.

2013-2015 **Identification of fracture properties using Digital Image and Volume Correlation.**

Funding body Departmental strategic development fund, Stellenbosch University.
Amount ZAR 120 000 for 2015.
ZAR 120 000 for 2014.
ZAR 120 000 for 2013.

TEACHING EXPERIENCE

Course title	Role (no of students)
SU - Stellenbosch University, UCT – University of Cape Town	

2015-2018	Strength of Materials (3rd year, SU)	Convenor and lecturer (±110)
2017-2018	Adv. Strength of Materials (postgrad, SU)	Convenor and lecturer (±15)
2016-2017	Intro. To mechanical Eng. (1st year, SU)	Lecturer (±300)
2012-2016	Machine Design A (3rd year, SU)	Convenor and lecturer (±160)
2012-2016	Machine Design B (3rd year, SU)	Lecturer (±160)
2013	Intro. to Machine Design (2nd year, SU)	Lecturer (±330)
2012	Strength of Materials (2nd year)	Lecturer (±180)
2011	Fracture Mechanics (Honours, UCT)	Convenor and lecturer (±40)
2011	Nuclear Engineering (Honours, UCT)	Teaching assistant (±20)
2007-2009	Mechanics of Solids (2nd year, UCT)	Tutor (±100)

POSTGRADUATE STUDENT SUPERVISION

	Qualification, institution	Name	Supervisory role
2018-in progress	PhD, SUN	Gerrit ter Haar	Supervisor
2017-in progress	PhD, SUN	William Makheta	Co-supervisor (T Oosthuizen)
2016-in progress	PhD, SUN	Melody van Rooyen	Supervisor
2016-in progress	PhD, SUN	Nur Dhansay	Supervisor (K Vanmeensel)
2012-in progress	PhD, UCT	Sergey Petrov	Co-supervisor (RB Tait)
2013-2017	PhD, SUN	Mathew Molteno	Supervisor
2018-in progress	MEng, SUN	Gerald Williams	Supervisor
2017-in progress	MEng, SUN	Devan Atkinson	Supervisor
2016-in progress	MSc Eng, UCT	Nicolas Cardenas	Co-supervisor (R Knutsen)
2014-in progress	MEng, SUN	Louis Goldberg	Co-supervisor (C Muller)
2016-2017	MEng, SUN	Lucas Anderson	Supervisor (J Westraadt)
2015-2017	MEng, SUN	Richard Huchzermeyer	Supervisor
2015-2017	MEng, SUN	Gerrit ter Haar	Supervisor
2014-upgr. PhD	MEng, SUN	Melody van Rooyen	Supervisor
2012-2015	MSc Eng, UCT	Nur Dhansay	Co-supervisor (RB Tait)
2012-2015	MSc Eng, UCT	Nadeem Gamiet	Co-supervisor (R Knutsen)
2012-2015	MEng, SUN	Johan Conradie	Supervisor (DZ Turner)
2011-2013	MSc Eng, UCT	Sicelo Gogo	Co-supervisor (DB Reddy)
2011-2012	MSc Eng, UCT	Mathew Molteno	Co-supervisor (RB Tait)
2011-2012	MSc Eng, UCT	Craig Knowles	Co-supervisor (RB Tait)

COMMITTEES AND ORGANISATIONAL INVOLVEMENT

2018 Chairman of Rapid Product Development Association of South Africa (RAPDASA).

- 2014, 2018 Technical committee for the South African Conference on Computational and Applied Mechanics (SACAM).
- 2015-2018 Section editor for the South African Journal of Industrial Engineering (SAJIE).
- 2014-2018 Management committee for the Rapid Product Development Association of South Africa (RAPDASA).
- 2017-2018 Technical committee for the International BSSM conference (UK).
- 2017 Chair of technical review committee for international RAPDASA conference (South Africa).
- 2015-2016 Steering committee for the Collaborative Programme in additive Manufacturing (CPAM).
- 2014-2016 Technical committee for the international RAPDASA conference (South Africa).
- 2014 Co-chair of RAPDASA international conferences organising committee (South Africa).

AWARDS AND HONOURS

- 2018 Nomination, Emerging Researcher of the year (TW Kambule-NSTF Awards).
- 2017 Finalist, Emerging Researcher of the year (TW Kambule-NSTF Awards).
- 2016 Most cited paper (Journal of Fatigue and Fracture in Engineering Materials)
- 2011 Best presentation award (SANHARP conference).
- 2010 Best paper award (International Youth Nuclear Congress)
- 2007 Sasol Excellence award (Failure Analysis' course)
- 2004-2005 Deans merit list.
- 1999 Best project in provincial science fair.

SCHOLARSHIPS

- 2009-2010 Pebble Bed Modular Reactor award for doctoral studies.
- 2009-2010 Doctoral Research Scholarship, University of Cape Town.
- 2007-2010 Harry Crossley Scholarship.
- 2003-2005 Doris Crossley Scholarship.

COLLABORATIONS

- 2013-2018 Prof James Marrow, University of Oxford. Identification of material properties using digital image and volume correlation.
- 2017-2018 Dr Mahmoud Mostafivi, Bristol University. Creep damage characterisation of thermal power plant steels.
- 2015-2018 Prof Jan van Humbeeck, Catholic University of Leuven. Residual Stress and fatigue measurement in Selective Laser Melted Ti-6Al-4V.
- 2012-2016 Robert Tait, University of Cape Town. Polycrystalline diamond compact fracture toughness investigation.

2014 Gerry Booyen, Central University of Technology. Material characterisation of Selective Laser Melted Ti-6Al-4V.

REFERENCES

Prof Gerhard Venter, Stellenbosch University, Department of Mechanical and Mechatronic Engineering, Jobert Street, Stellenbosch 7600, South Africa. tel +27-21-8083560, email gventer@sun.ac.za

Prof Jan van Humbeeck, University of Leuven, Department of Materials, Kasteelpark Arenberg 44, 3001 Leuven. tel Tel: +32-16321281, email jan.vanhumbeeck@kuleuven.be

Prof James Marrow, University of Oxford, Department of Materials, Parks Road, Oxford OX1 3PH, United Kingdom. tel +44-186-5273938, email james.marrow@materials.ox.ac.uk

Prof Robert Tait, University of Cape Town, Department of Mechanical Engineering, Library Road, Rondebosch 7701, South Africa. tel +27-21-6503249, email robert.tait@uct.ac.za.