

## Draft Programme 2023 RAPDASA-RobMech-PRASA-AMI Conference

### Monday 30 October 2023

08:30 Pre-conference seminar on Design and Additive Manufacturing of Titanium and Platinum Group Metal Parts – Dr Dean Kouprianoff

08:30 Pre-conference seminar on Computational and Data-driven Modelling – Dr Rose Modiba

09:00 Industry Day – Heinrich van der Merwe

17:00 Welcome cocktail & registration

### Tuesday 31 October 2023

TIME	DAY 1							
08:00	Registration							
08:30	Welcome and opening – Chairpersons 2023 RAPDASA-RobMech-PRASA-AMI Conference organizing committee – Prof Deon de Beer and Dr Lerato Tshabalala							
08:35	Introduction by RAPDASA chairperson – Dr Ntombi Mathe-Malebobo (session chair)							
08:45	Welcoming by CSIR CEO: Dr Thulani Dlamini							
09:00	Keynote address K1: Prof Upadrasta Ramamurty - Nanyang Technological University, Singapore: Structural integrity of 3D printed metals							
09:30	TEA/COFFEE BREAK							
09:40	Poster session							
10:20	Keynote Address K2: Prof Miranda Fateri – Aalen University, Germany: In-Situ Resource Utilization (ISRU)							
10:50	Keynote Address K3: Dr Eujin Pei – Brunel Design School, Brunel University London: Advances in 4D Printing and Applications							
11:20	BREAKAWAY SESSIONS							
	<b>Room 1:</b>		<b>Room 2:</b>		<b>Room 3:</b>		<b>Room 4:</b>	
	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Material Development		Theme: Robotics and Mechatronics		Theme: Product Design & Development		Theme: Computational & Data-driven Modelling	
	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter
11:30	Composition design of Low Young's Modulus $\beta$ -Ti Alloys using the Cluster-Plus-Glue-Atom Model for orthopaedic applications	Noluntu Muchavi	Streamlining factory simulations with an intuitive factory layout tool	Willis de Ronde	Implementation of a digital twinning approach to improve designs of polyurethane heart valves	Lebohang Masheane	The behaviour of monazite-(La) at high pressure: a first principle study	Lebogang Motsomone
11:50	Recycling PA12 powder from laser powder bed fusion through producing filament for fused deposition modelling	Kobus van der Walt	A.R.G.U.S: A pole climbing surveillance robot	Willis de Ronde	Using 3D printing to fabricate microfluidic chips for biosensing applications	Masindi Sekhwama	Detection of SARS CoV-2 from Raman Spectroscopy Data Using Machine Learning Models	Nkgaphe Tsebesebe
12:10	An investigation on SWAAT corrosion behaviour of a 0.3mm thick sheet roll-bonded and brazed aluminium alloy - AA4045/AA3003	Joseph Moema	Using a multi-robot system for improved path-planning	Kyle Ahlschlager	Additive manufacturing in the development of patterns and low-cost tooling for in-class manufacture	Martin Bolton	Engineering of TiN (N = 1 – 15) nanoclusters by doping osmium impurity	Ramalebana Moeti
12:30	Understanding the microstructure and hardness properties of in-situ synthesized hybrid (TiB+TiC)/Ti6Al4V-ELI composite manufactured with laser metal deposition	Kgothatso Mokomele	Bench Satellite Development and Testing	Willem Jordaan	Applying design for additive manufacturing to existing aerospace parts	Duwan Bester	The influence of holmium doping on the magnetic and mechanical properties of Nd <sub>2</sub> Fe <sub>14</sub> B: a computational study	Mphamela Enos Baloyi
13:00	LUNCH BREAK							
	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Material Development		Theme: Robotics and Mechatronics		Theme: Process Development		Theme: Computational & Data-driven Modelling	

	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter
14:00	Comparison of complex inclusions in cast slabs of 18 % chromium dualstabilised ferritic stainless steels	Rutendo Matengaifa	Design of HERMES: A Mobile Autonomous Surveillance Robot for Security Patrol	John Dickens	In-situ Alloying of Ti-4.7Mo-4.5Fe alloy using laser powder bed fusion	Thuli Mkhalihi	Classification of heat-treated carbon steel microstructures using convolutional neural network based deep learning	Anuj Kumar
14:20	Plasma spheroidisation of commercial Ti6Al4V Grade 5 powder for metal additive manufacturing	Nthateng Nkhasi	Reliability of visual inertial odometry on an unmanned aerial vehicle	Tiro Setati	Showcasing next-gen manufacturing management technology sandbox	Malika Khodja	Au- and Ag-nanoparticle interaction with fibrin protein molecules	Malesela Walter Makgoba
14:40	Nano mechanical properties of a single layer TiC/Ti6Al4V-ELI composite manufactured with laser metal deposition	Pushetso Ramasobane	The implementation of an optical computer mouse as a low-cost displacement sensor	Wesley Dharmalingum	Development of a compression moulding process for the manufacturing of artificial polymer heart valves	Ronald Masheane	Comparative study on adsorption of novel S-triazine collectors with xanthate on sperrylite mineral from DFT-D3 and microcalorimetry	Bradley Nemutudi
15:00	The Role of Hydrogen in the formation of Intergranular Secondary Cracks in High Strength Aluminium Alloys during Plastic Straining	Christiaan Pretorius	Design of a remotely accessible satellite tracking system	Daniel Kirkman	Evaluating DOE methods for parameter development in SLM	Schalk Ackerman	Optimum inhibition process variables of avocado seed nanoparticle extract (ASNE) on API X65 steel corrosion using response surface methodology	Modupeola Dada
15:20	Comparative property assessment and characterisation of cast austenitic iron-nickel-chromium alloys	Lebedike Mampuru	Place recognition on a mobile robot using convolutional neural networks and transfer learning	Beatrice van Eden	Understanding the inhibitory mechanism and protection performance of avocado seed nanoparticle extract on API X65 steel corrosion in 1M HCl acid environment	Modupeola Dada	Investigation of structural, mechanical and electronic properties of TiM (M: Mo, Zr, Mg, and Ta) alloys for biomedical applications using the first principle approach	Kobe Mabeba
15:40	TEA/COFFEE BREAK							
16:00	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Material Development		Theme: Robotics and Mechatronics		Theme: Process Development		Theme: Computational & Data-driven Modelling	
	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter
16:00	Investigating the structural stability on Mn-rich LiMn1.5Ni0.5O <sub>2</sub> cathode material for lithium-ion battery	Moloko Emmanuel Kgoedi	Methods of workspace generation for parallel kinematic manipulators	Wesley Dharmalingum	Dynamic tap density as a powder characterisation technique for metal powders	Andri de Waal	Study of shape memory properties of TiNi(50-x)-Mx (M = Nb, Fe, Mo) alloys for biomedical applications using first-principles calculations	Thabiso Mathews
16:20	Nanomechanical Characteristics of Laser and Arc Melted AlCuFeNiSi High Entropy Alloy: A Comparative Study	Modupeola Dada	Heterogeneous compute for low-cost robotic platforms	Callen Fisher	Effect of cooling rate on the microstructure and mechanical properties of Ti-V microalloyed steel	Seyed Reza Jafarpour Rezaei	Machine learning models for predicting density of sodium-ion battery materials	Keletso Monareng
16:40	The effect of increasing Hf on the microstructure, phase transformation temperatures and hardness of Ti – Pt – Hf shape memory alloy	Tebogo Motsai	Simulating object handover between collaborative robots	Beatrice van Eden	Hot corrosion effect of the vacuum arc melted $\alpha_2/\gamma$ Ti-48Al-2Nb-0.7Cr-0.3Si alloy under NaCl-Na <sub>2</sub> SO <sub>4</sub> salt environment	Steven Magogodi	Simulated synthesis and atomic-level structural characterization of LiNi <sub>2</sub> O <sub>4</sub>	Donald Hlungwani
17:00	Closure – no event scheduled for this evening							

## Wednesday 1 November 2023

TIME	DAY 2							
08:00	Opening and Welcome: Chairpersons 2023 RAPDASA-RobMech-PRASA-AMI Conference organizing committee – Prof Deon de Beer and Dr Lerato Tshabalala							
08:05	PLENARY SESSIONS: Chair:							
08:10	Keynote Address K4: Kyle Mason – Markforged Territory Sales Manager - Nordics, Middle East & Africa: Industrial Production at the Point of Need with the Digital Forge							
08:40	Keynote Address K5: Prof Steffen Schwarzer – Aalen University, Germany: Sustainable manufacturing processes with the help of artificial intelligence (AI)							
09:10	Keynote Address K6: Prof Ian Campbell – Loughborough University, UK: Three decades in AM - a personal reflection							
09:40	TEA/COFFEE BREAK							
10:00	Keynote Address K7: Prof Ian Gibson – Dept. of Design, Production & Management, University of Twente: What do we still need to do to get AM into industry?							
10:30	Keynote Address K8: Mr Russel Oosterlaak - 3D Solids AMT: Fused Deposition Modelling technology in the South African market over the last 20 years							
11:00	BREAKAWAY SESSIONS							
	Room 1:		Room 2:		Room 3:		Room 4:	
	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Material Development		Theme: Robotics and Mechatronics		Theme: Process Development		Theme: Computational & Data-driven Modelling	
	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter
11:10	Effects of Sn on the densification and microstructure of a Ti-48Al-2Nb-0.7Mn-0.3Si-1Sn alloy fabricated from cold-pressed powders through vacuum melting	John Ellard	3D mapping and photogrammetry sensor payload for unmanned aerial vehicles	Kyla Purdon	A review of the types and tessellation of lattice structures, their effectiveness and limitations in mimicking natural cellular structures	Munashe Chibinyani	Structural properties of P2 and O2-type layered lithium manganese oxides as potential coating materials	Precious Makhubela
11:30	Evolution of microstructures in high and low Ti/Al mass% ratio ferritic stainless steels after hot rolling	Joshua Tuah Asante	Prototype Design of an Aerial Robotic Platform for Inspection and Monitoring Applications	Natasha Botha	Improving mechanical properties of Ni electrode through alloying and heat treatment	Mokgohloa Caroline Mphela	Structural and dynamical properties of sperrylite (PtAs <sub>2</sub> ): a molecular dynamics simulation study	Segoarihle Ntobeng
11:50	Spark plasma sintered Ti-35Nb-7Zr-5Ta-1Cu alloy	Tinyiko Rose Nkuna	Touch Hand 4.5: Evaluation of results for Cybathlon 2020 arm discipline	Daniel Kirkman	Monitoring for cracks in metal L-PBF using gas-borne acoustic emission	Karabo Moore	Transition metal carbonates as cathode materials for lithium-ion batteries: first principles study	Mogahabo Morukuladi
12:10	The investigation of mechanical stir casting of A356 (Sr doped) Al alloy	Ntswaki Nyakane	Voyager, a ground mobile robotic platform for research development	Kyla Purdon	V2O5 nanostructures for gas sensing mechanism, doping, and low temperature detection of Methanol, Ethanol and NO <sub>2</sub> with superior response of H <sub>2</sub> S	Mick Molukie Mokwena	The effect of systematic substitution of Nb with Ti on a potential high temperature shape memory alloy: B2 NbRu	Duduzile Nkomo
12:30	Hydrogen intake and diffusible hydrogen concentration measurements of steels using Thermal Desorption Mass Spectrometry (TDMS)	Tresor Okabo Mapoli	Modular robotic arm for automation of SMME industrial press	Danny Naicker	In-situ production of the Ti6Al4V alloy from a blend of commercially pure Ti and plasma atomised AL-V master alloy powders	Lekhetho Ramosena	Detection of SARS-CoV-2 from Raman Spectroscopy Data Using Machine Learning Models	Nkgaphe Tsebesebe
13:00	LUNCH BREAK							
14:00	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Material Development		Theme: Robotics and Mechatronics		Theme: Process Development and Robotics & Mechatronics		Theme: Computational & Data-driven Modelling	
	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter

14:00	Microstructural and Micro-hardness of Ti-15.05Mo alloy for biomedical applications	Nthabiseng Moshokoa	Optimization based path planning and collision avoidance for autonomous racing	Oran Keanly	An evaluation to determine the suitability of a new polypropylene powder for powder bed fusion	Lorinda Wu	Thermodynamic Study and Transition Metal Doping on Li <sub>1.2</sub> Mn <sub>0.8</sub> O <sub>2</sub> as a Cathode Material	Vusani Mikosi
14:20	Effect of nickel on carbon solubility in austenite solid solution	Absalom Mabeba	Model-free trajectory planning for a rotary-wing unmanned aerial vehicle with an uncertain suspended payload	Willem Jordaan	Laser powder bed fusion of refractory metals	Alfred Sidambe	First-principles study on the effect of Ni addition on the stability of B2 Ti <sub>50</sub> Ru <sub>50</sub> – a supercell approach	Bongani Ngobe
14:40	Effects of particle charging during RF plasma spheroidisation process	Milton Makhofane	4-RRS PKM for stabilization on a mobile sensor platform	Kshir Ramruthan	Effect of heat-treatment on corrosion performance of Ni and Ni-Cr based alloys	Kholo Veronica Morudu	Ab initio calculations of magnesium spinel's [MgY <sub>2</sub> S <sub>4</sub> and MgY <sub>2</sub> Se <sub>4</sub> ]	Khumbulani Tibane
15:00	Investigation of TiB distribution characteristics on the microstructure of in-situ TiB/Ti <sub>6</sub> Al <sub>4</sub> V manufactured by laser metal deposition	Paul Lekoadi	Optimised path planning of a UAV for inventory management applications	Thabisa Maweni	Motion Planning for a Hexapod Robot over Uneven Terrain	Jason Di Leva	Stability of NaO <sub>2</sub> and LiO <sub>2</sub> discharge products in metal-air batteries: Density functional theory study	Brian Ramogayana
15:20	TEA/COFFEE BREAK							
	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Material Development		Theme: Robotics and Mechatronics		Theme: AM Material & Part Characterisation		Theme: Computational & Data-driven Modelling	
	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter
15:40	Determining optimum process parameters for the deposition of a functionally graded SS316L-WC coating fabricated via directed energy deposition	Takudzwa Tendere	Gait generation for real-time quadruped locomotion	Ernst Jordaan	Characterisation of bone-regenerating scaffolds produced through lithography-based ceramic manufacturing	Morakane Moletsane	The effect of Ni on the stability of Li <sub>2</sub> MnO <sub>3</sub> cathode material: a DFT study	Mamonamane Mphahlele
16:00	Arduino as a simple design and prototyping tool for all	<b>Invited speaker:</b> Prof Pierre Hertzog	Autonomous navigation for multiple unmanned aerial vehicles (UAVs) in urban environments	Merrick Hughes	Microstructural effects on properties of as-fabricated Inconel 625 with direct energy deposition process	Theo-Neal Booyesen	The size and temperature effect on titanium Ti7 cluster in β-TiCl <sub>3</sub> medium	Andile Mazibuko
16:30	RAPDASA ANNUAL GENERAL MEETING							
19:00	GALA DINNER - Speaker: Prof Alfred Ngowi – Deputy Vice-Chancellor: Research, Innovation and Engagement, Central University of Technology, Free State Prize-giving ceremony							

## Thursday 2 November 2023

TIME	DAY 3							
08:00	Opening and Welcome: Chairpersons 2023 RAPDASA-RobMech-PRASA-AMI Conference organizing committee – Prof Deon de Beer and Dr Lerato Tshabalala							
08:05	PLENARY SESSIONS: Chair:							
08:10	Keynote Address K9: Prof Markus Merkel – Institute for Virtual Product Development, Aalen University: 3D Metal Printing for Engineering Applications							
08:40	Keynote Address K10: Prof Olaf Diegel – Centre for Advanced Materials, Manufacturing & Design, University of Auckland: Design for Additive Manufacturing: Understanding Value							
09:10	Keynote Address K11: Prof Raesibe Sylvia Ledwaba – University of Limpopo: Enhanced Electrochemical Performance Driven by Ionic Doping Strategies for Lithium Rich Layered Oxides (LRLO) Cathodes							
09:40	TEA/COFFEE BREAK							
10:00	Keynote Address K12: Prof Paulo Bartolo -							
10:30	Keynote Address K13: Dr Devon Hagedorn-Hansen – HH Industries, Somerset West, South Africa: Additive Manufacturing in Africa: Past, Present, and Future							
11:00	BREAKAWAY SESSIONS							
	Room 1:		Room 2:		Room 3:		Room 4:	
	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Rapid Casting		Theme: AM Post Processing & Qualification		Theme: AM Material & Part Characterisation		Theme: Product Design & Development	
	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter
11:10	Thermal reclamation of used sand produced from binder jetting process	Thapelo Precious Thaba	Effect of heat treatment temperature on the microstructure and mechanical properties of TiC/Ti64 composite manufactured with laser metal deposition	Reneilwe Kgoahla	Neutron diffraction studies on additive manufactured metallic parts	D Marais	The challenges associated with fused deposition modelling of high-density polyethylene for facial augmentation implants: a review	Rebakakgosi Mohutsiwa
11:30	Technical and financial feasibility assessment of producing an impeller sand mould by three-dimensional printing using a VOXELJET VX 1000 machine	Anazo Msani	Implementation of the total quality management tool in spheroidisation	Tsepo Dube	Atomisation of Ti-6Ta-1.5Zr-0.2Ru-5Cu (wt%) for additive manufacturing for biomedical applications	Ngwakoana Phala	Enhancing Engineering Drawing Pedagogy: Exploring the Potential of 3D Printing Techniques	Blessed Sarema
11:50	The effects of new sand addition during the recycling of three-dimensional printing sand on the mechanical properties of foundry moulds and cores	Makwena Annikie Matjila	Microstructural characterisation of Ti6Al4V alloy produced by conventional manufacturing process and LPBF for aerospace structural application: a comparative review	Diali Phillip Mokoena	Effect of thermal cycling on the flexural and compression strength of permanent resin restorations	Ankia Saayman	Effects of processing conditions of laser wire directed energy deposition on the properties of 309L stainless steel	Tefelo Mampheko
12:10			Significance of surface finish in the fatigue performance of laser shock peened Ti6Al4V	Mufaro Kanganga	Assessing the Impact of Process Parameters on Lattice Structure Manufacturing Defects through Micro-CT Scanning	Minsol Park	Investigating tool wear in ultra-precision diamond turning of rapidly solidified aluminium alloy (RSA- 443)	Zwelinzima Mkoko
12:30			Near-threshold fatigue crack growth behaviour of laser powder bed fusion produced AlSi10Mg	Mary-Kate Oosthuizen	Microstructural characterisation of additively manufactured Ti-6Al-4V with the addition of beta stabilizer niobium	Khutso Mrwata	Towards the effective development of design for additive manufacturing curricula: an exploration of strategies and solutions in education	Sarel Havenga
13:00	LUNCH BREAK							
14:00	Session Chair:		Session Chair:		Session Chair:		Session Chair:	
	Theme: Pattern Recognition		Theme: AM Post Processing & Qualification		Theme: AM Material & Part Characterisation		Theme: Product Design & Development	
	Title	Presenter	Title	Presenter	Title	Presenter	Title	Presenter

14:00	Enhancing distracted driver detection with human body activity recognition using deep learning	Frank Zandamela	Implementing Digital Twinning in an Additive Manufacturing Process Chain	Kekeletso Thejane	3D printing for heat transfer: Characterisation of additive manufactured copper	Bradley Bock	Design optimisation of TPU modular footwear for sustainable fashion: a South African Fashion Week case study, 2023	Philip van der Walt
14:20	Automated uniform recognition to enhance video surveillance at correctional services in South Africa	Dumisani Kunene	X-Ray diffraction profile analysis of martensitic Ti6Al4V(ELI) parts produced by laser powder bed fusion	Amos Muiruri	Investigation of the corrosion behaviour of TiC/Ti6Al4V manufactured through laser additive manufacturing	Matshela Tshepho Hosia Kgomo	Synthesis of photocatalytic TiO2 nanotubes on Additively Manufactured Ti-Alloy substrates	Gerrit Ter Haar
14:40	A digital twin framework to support vehicle interaction risk management in the mining industry	Jacobus Prinsloo	Laser Shock Peening of Laser Powder Bed Fusion produced Ti6Al4V for Potential Improvements to Implant Performance	Tristan Strydom	The effect of build orientation and heat treatment on fracture toughness of AlSi10Mg by laser powder bed fusion	Limpho Pitso	Effect of normal load on the wear and rolling contact fatigue behaviour of AAR class B steels against R350HT rail on a twin disc simulator	Tshenolo Phinah Leso
15:00			Ethical considerations in bioprinting: what are the issues?	Laetus Lategan	X-Ray computed tomography vs Archimedes method: a head-to-head comparison	Tebogo Ledwaba	The design of an additively manufactured passive desktop heat sink with the use of TPMS lattices	Wian van Aswegen
15:20	TEA/COFFEE BREAK							
15:40 to 16:40	Women in 3D Printing, Chair: Dr Malika Khodja							
16:40	CLOSURE							