

## **Kamaal S. Al-Hamdani, BSc, MSc & PhD**

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### **• Education and Qualifications**

**Oct 2015 - November 2019: The University of Nottingham, PhD in Mechanical, Materials, and Manufacturing Engineering: Deposition of Composite Coatings**

**PhD thesis: Deposition of Satellited Al-TiC Powders for Coating Applications.**

- Cold spray (CS) is an important technique used to deposit different types of materials without the need for heating or melting. Because of the dependence of cold spray on deformation of the sprayed and substrate materials, hard particles tend to rebound, while less-ductile materials experience limited deformation during impact. Laser cladding (LC) has some advantages in terms of surface processing over other techniques, including narrow wavelength, low divergence, and a highly coherent beam. However, the use of blended feedstocks within powder-injection LC can lead to the separation of the blended phases that may cause stream.
- Satelliting is a simple powder-mixing process recently used to produce composite feedstocks consisting of fine ceramic particles attached to the surfaces of relatively large (parent) metal particles. This is based on adding a small amount of liquid binder to the powder mixture during the mixing process without the need for high energy or heat. The main point of investigation of this research is the use of satellited Al-TiC feedstocks for cold spray and laser cladding processes, along with blended feedstocks with the same compositions for comparison. This is a trails for improving the behaviour of the composite coating by increasing the reinforcement fraction through elimination particles rebounding.
- In the first stage of this work, preliminary satelliting processes were performed using TiC as a reinforcing phase, adjusting the fraction of Al powder and the binder to produce a satellited powder. The prepared satellited powder then was used in the CS process to evaluate its cold-sprayability, this was along with pure Al and blended Al/TiC feedstocks for comparison purposes. A seven-fold increase in TiC area fraction was measured in the satellited coating compared to that in the blended coating.
- In the second stage, the effects of using the satelliting technique on the deposition and characteristics of composite coatings of a less-ductile Al alloy (A6061) and TiC, fabricated by cold-spray were investigated. The use of satellited feedstock has resulted in increasing the TiC catchment and deposition efficiency by 66% and 78%, respectively, compared to the blended feedstock. The satellited coating presented a reduction of 67% in the interlamellar porosity compared with the blended 6061/TiC coating, while the heat-treated coating exhibited a 70% reduction in interlamellar porosity.
- Finally, the behaviour of Al/TiC satellited feedstock under laser cladding was investigated along with a blended feedstock. The blended and satellited and have presented several differences regarding: clad geometry, clad area, TiC fraction and other characteristics. These differences indicated a different interaction of the satellited feedstock with the lase radiations; thus, two interaction mechanisms between the laser radiation and the feedstocks were suggested and demonstrated depending on their morphologies.

**Jan 2015 – Sep 2015: The University of Nottingham, Certificate in English Language for Academic Purposes**

- It was 30-weeks academic English course focused on preparing and developing the academic skills of students including presentation skills, academic writing, listening and speaking.

**Oct 2009 – Nov 2011: The University of Baghdad, MSc in Mechanical Engineering / Manufacturing and Industrial Engineering**

MSc Dissertation: **Experimental investigation of Tee-section welding using friction stir welding process of Aluminum**

**Oct 1999 - Jul 2003: The University of Baghdad, BSc in Mechanical Engineering**

• **Career and Volunteering Positions**

**June 2011 – Present: The University of Thi-Qar, the School of Engineering**

- Currently, I am a lecturer and researcher in Mechanical Engineering School at the University of Thi Qar.
- Working as a registrar and manger of the student affairs unit at the college of engineering.

**Feb 2016 – Mar 2019: Worked (part-time) as demonstrator at The University of Nottingham, Faculty of Engineering, Mechanical, Materials, and Manufacturing Engineering.**

I worked as a part-time demonstrator during my PhD studies; demonstrated different mechanical test labs for 1st year engineering students and helped them in doing their experiments. The position also involved in marking and assessment student-works.

**Feb 2016 – Nov 2019: member of the Advanced component engineering laboratory (ACEL) at The University of Nottingham, Faculty of Engineering, Mechanical, Materials, and Manufacturing Engineering.**

**Feb 2017 – Nov 2019: member of the Advanced Materials Research Group at The University of Nottingham, Faculty of Engineering, Mechanical, Materials, and Manufacturing Engineering.**

**Jan 2018 – Jan 2020: member of IOM3, the Institute of Materials, Minerals and Mining!**

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- **Publications and Conferences**

|   | year | Publication   | DIO   |
|---|------|---|---|
| 1 | 2017 | Cold sprayed metal-ceramic coatings using satellited powders  | <a href="https://doi.org/10.1016/j.matlet.2017.03.175">https://doi.org/10.1016/j.matlet.2017.03.175</a>     |
| 2 | 2018 | Novel nucleation mechanisms through satelliting in direct metal deposition of Ti-15Mo                       | <a href="https://doi.org/10.1016/j.matlet.2017.11.036">https://doi.org/10.1016/j.matlet.2017.11.036</a>     |
| 3 | 2018 | Direct metal deposition of TiB <sub>2</sub> /AlSi10Mg composites using satellited powders                   | <a href="https://doi.org/10.1016/j.matlet.2017.11.121">https://doi.org/10.1016/j.matlet.2017.11.121</a>     |
| 4 | 2019 | Heat-treatment and mechanical properties of cold-sprayed high strength Al alloys from satellited feedstocks | <a href="https://doi.org/10.1016/j.surfcoat.2019.05.043">https://doi.org/10.1016/j.surfcoat.2019.05.043</a> |
| 5 | 2019 | Laser powder bed fusion of a Magnesium-SiC metal matrix composite   | <a href="https://doi.org/10.1016/j.procir.2019.03.137">https://doi.org/10.1016/j.procir.2019.03.137</a>     |
| 6 | 2019 | Deposition of satellited Al-TiC powders for coating applications  | (PhD thesis)  |
| 7 | 2020 | Controlling ceramic-reinforcement distribution in laser cladding of MMCs                                    | <a href="https://doi.org/10.1016/j.surfcoat.2019.125128">https://doi.org/10.1016/j.surfcoat.2019.125128</a> |
| 8 | 2014 | Defects Analysis of Tee-Section Welding Using Friction Stir Welding Process of Aluminum                     | <a href="https://www.iasj.net/iasj/article/93556">https://www.iasj.net/iasj/article/93556</a>               |
| 9 | 2013 | Study the Effect of Filler in Flash Welding of Copper Wire on Microhardness and Microstructure              | <a href="https://www.iasj.net/iasj/article/79908">https://www.iasj.net/iasj/article/79908</a>               |

## **SKILLS and COURSES**

### **• IT Skills**

- Microsoft Office products.
- AutoCAD software (3D Solids, Isometric Drawings, PID and Flow Diagrams)
- Mountain Map (3D image processing).
- ImageJ (Image processing).
- OriginPro (statistical analysis)

### **• Characterization Skills**

- Optical microscope
- Secondary electron microscope (SEM, BSE and EDX)
- Electron Probe Micro Analysis (EPMA).
- X-ray diffraction.
- X-ray Wavelength Dispersive Spectroscopy (WDS).
- Particle size distribution (Malvern Mastersizer).



### **Experimental experience**

- Laser deposition.
- Cold spray deposition.
- Mechanical tests (microhardness, wear, surface roughness and tensile).
- Heat treatment processes.



### **Training Courses (University of Nottingham)**

- Sample preparation for microstructural inspection.
- Laser processing safety.
- Teaching in high education institutions.
- Academic writing.
- Basic Statistics with SPSS.
- Microsoft Outlook.
- Time Management and Workload Organisation,
- Finishing your thesis.
- Introduction to ABAQUS software.
- Introduction to MATLAB for Engineers.