Suryasarathi Bose
Associate Professor, Department of Materials Engineering
Indian Institute of Science, Bangalore-560012

TO WHOMSOEVER IT MAY CONCERN

It gives me a great pleasure to write this reference letter for Nidhish Sagar who has applied to NTU-India Connect Summer Research Internship for 2020. Nidhish is presently pursuing his bachelors program in Indian Institute of Science Bangalore, one of the best institutes in India with 'Materials' major.

I know Nidhish for the past one year and had supervised his internship at India Institute of Science Bangalore. His internship involved systematic understanding of the effect of porosity in CoCrMo and SS316L additively manufactured super alloys and their applications in osteo-integration. During this internship he analysed various implant materials like Cobalt and Steel based alloys for their osteo-integration characteristics and strength. He also studied the manufacturing processes and porosity that is enabled in these materials and evaluated ways to improve the mechanical properties by changing 3D printing parameters. In this process, he learnt various tools like microhardness, X-Ray Diffraction, Optical Imaging and Analysis, wet chemistry techniques and small scale mechanical testing. He presented the outcome of this work in an in-house symposium and won the best poster award. Besides this, he also worked in covalent cross-linked Phosphorene with MoS2 and graphene during his internship at International Centre for Materials Science (ICMS), JNCASR Bangalore.

I have seen him to put hours of hard work in understanding such systems that are not only relevant from academic perspective but also is from industrial standpoint. In this process, he has made a stupendous progress in learning high-end characterization techniques. He bears a very pleasant character, which has helped him to work successfully with a large number of research groups here at IISc. Given an opportunity, Nidhish will be an asset for his integrity, honesty, strong academic mindset, sincerity, hardworking nature, and strong sense of responsibility.

Therefore, I strongly support his application for NTU-India Connect Summer Research Internship for 2020.

24-12-19

Department of Materials Engineering, Indian Institute of Science, Bangalore-560012
Phone: +91-80-2293-3407, Email: sbose@materials.iisc.ernet.in

SURYASARATHI BOSE
Associate Professor
Department of Materials Engineering
Indian Institute of Science
Bangalore - 560 012, India

Sinteneering Innovations

INTECH DMLS PVT. LTD.

No. B-117, 3rd Main Road, 2nd Stage, Peenya Industrial Area, Bangalore - 560 058 India
Phone : +91 80 41474668 | 41744668 | Email : info@intech-dmls.in | URL : www.intech-dmls.in

To Whomsoever Concerned

This is to certify that **Nidhish Sagar** has successfully completed his 1st year (B.S.) summer internship at INTECH DMLS Pvt. Ltd., Bangalore. His tenure was for the duration, 14th of May - 14th of July 2018.

Nidhish worked in laser additive manufacturing of two different alloys used in the Aerospace and Healthcare sectors during his internship on,

"Characterization and Mechanical Properties of Direct Metal Laser Sintered (DMLS) CoCrMo and SS316L in the As printed and Heat-Treated Condition"

Nidhish' s research study dealt with establishing the baseline characterization of popular direct metal laser sintered (DMLS) alloys, CoCrMo and SS316L, as a precursor to developing 3D printed scaffolds for examining superior osteo integration for in-vivo medical Implants. Within the first week of joining Nidhish was able to have a quick grasp of the subject, engage in conversations within colleagues in various groups at IISc, as well as with global experts, and was able to learn and demonstrate proficiency in hands on metallography, including establishing etching of a very hard to etch alloy. He was also enterprising in being able to resource, during the short span of 6 weeks, various characterization and heat treatment facilities, to get the work accomplished in a very timely manner, from more than a dozen different characterization and testing laboratories at IISc. In particular, his initiative to self-learn and get certified as an independent user of a sophisticated characterization equipment, the Scanning electron microscope is commendable.

His eagerness to demonstrate hands on skills as well as technical understanding of XRD, microhardness, Image analysis, Microscopy (Optical and SEM), Surface Roughness and Mechanical testing was well appreciated by over half a dozen senior graduate students at IISc with whom he managed to quickly interact with, during his internship. Nidhish has also been able to carry out some preliminary analysis of 3D printed scaffolds (for prospective cell culture studies) using X-ray tomography.

The two comprehensive reports on both the DMLS alloys, CoCrMo and SS316L, will serve as a valuable reference and will be published in the internal INTECH archival records, as well as serve as a key report to be shared with customers. They will also be presented in an upcoming international conference.

All the characterization carried out by Nidhish was done at the Materials engineering department and the Advanced facility for microscopy and microanalysis at the Indian Institute of Science, Bangalore, facilitated by Prof. Suryasarathi Bose. We wish Nidhish the very best in all his future endeavours.

Dr. Dheepa Srinivasan
Consultant
INTECH, DMLS Pvt. Ltd.
Peenya, Bangalore 560065
July 14th, 2018

24/12/19
Dr. Dheepa Srinivasan
Chief Engineer
Prattandwhitney
R&D centre

Nanaiah M A
General Manager
INTECH, DMLS Pvt. Ltd.
Peenya, Bangalore 560065