Intelligent Manufacturing & Mechatronics

Proceedings of Symposium, 29 January 2018, Pekan, Pahang, Malaysia

Editors: **Hassan**, Mohd Hasnun Arif (Ed.)

Mohd Hasnun Arif Hassan
Editor

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Preface

The Symposium on Intelligent Manufacturing and Mechatronics (SympoSIMM) 2018 was held at Universiti Malaysia Pahang in Pekan, Pahang, Malaysia, on 29 January 2018. It was organized by the Faculty of Manufacturing Engineering, Universiti Malaysia Pahang (UMP), in collaboration with the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka (UTeM), Melaka. Both parties aimed to provide a platform for deliberating empirical and theoretical research that are foreseen in the context of Industry 4.0. With the theme of "Strengthening Innovations Towards Industry 4.0", it is the first dedicated symposium to Industry 4.0 hosted by the organizers. The symposium was graced by a vivacious keynote speech entitled "The Ideas of Mechatronics" by Prof. Ir. Dr. Wan Azhar Wan Yusoff.

This symposium enticed 120 submissions from authors nationwide. All submissions underwent a strenuous peer review process from members of the Peer-Reviewing Technical Committee. The reviews were based on the manuscript's relevance to the tracks, novelty of the findings, the importance and presentation of the studies towards the particularity of Industry 4.0's current trends. Following the review process, only 65 submissions made it into the symposium, 15 submissions were withdrawn, and 40 submissions were rejected due to various reasons. The accepted submissions were divided into five tracks covering various scopes of manufacturing engineering and mechatronics stream, namely Intelligent Manufacturing, Robotics, Artificial Intelligence, Instrumentation, and Modelling and Simulation. This book was divided into five parts based on the aforementioned tracks.

We would like to express our gratitude to all members of the Organizing Committee, without which the organization of this symposium would never be possible. Special thank goes to the management of the Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, for the support towards the successful organization of the symposium. Further, we would like to extend our thanks to all authors for their participation in the symposium and their valuable contribution to this book. Last but not least, we would like to appreciate the help from the

publisher, especially to Dr. Christoph Baumann and Mr. Arumugam Deivasiga-mani. We hope that the contents of this book will benefit the readers in embracing the new era of industrial revolution 4.0.

Pekan, Pahang, Malaysia   Mohd Hasnun Arif Hassan
January 2018   Zamzuri Hamedon
                                                                        Siti Zubaidah Ismail
                                                                    Ahmad Shahir Jamaludin
                                                                    Muhammad Aizzat Zakaria
                                                                Ahmad Shahrizan Abdul Ghani
                                                                        Nurul Akmal Che Lah
                                                                        Nurul Hidayah Razak
                                                                    Ahmad Fakhri Ab. Nasir
                                                                Ahmad Najmuddin Ibrahim
                                                                            Asrul Adam
                                                                        Zulhelmi Ismail
                                                                        Mohd Yazid Abu
                                                                    Radhiyah Abd. Aziz

Contents

A Resonant Type AC Magnetometer for Evaluation of Magnetic Nanoparticles

Nazatul Sharreena Suhaimi, Mohd Mawardi Saari, Hamzah Ahmad, Mohd Rusllim Mohamed and Nurul Akmal Che Lah

Abstract Characterization of magnetic nanoparticles is crucial in order to optimize them for different applications requiring specific characteristics. In this article, we report a characterization system using AC susceptibility method. An AC magnetometer system which is composed of the induction coil and resonant capacitors is developed to evaluate the performance of the magnetic nanoparticles. The induction coil consists of excitation and detection coil. The excitation coil is designed with solenoid coils and fabricated with a Litz wire which is composed of 60 strands of copper wire with 0.1 mm diameter to reduce the increase of AC resistance at high frequency. The detection coil is designed to be a first-order differential coil which is used to reduce the environmental noise and cancel the excitation magnetic field. The detection coil is fabricated with a copper wire and it is placed at the center of the excitation coil. The excitation coil is connected to the resonant capacitors to cancel the reactant component and to permit the high magnetic field in the high-frequency region. The resonant capacitors are fabricated with multiple values of capacitors. When the developed system is in the resonant mode, the current flow is constant up to the frequency of 32.5 kHz. The developed system can evaluate the magnetic nanoparticles at different frequency responses. Using the developed system, it is shown that the Neel particles exist inside the solution of magnetic nanoparticles used in this study.

Keywords AC magnetometer · Magnetic nanoparticles · Coil

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