

Rheological Properties of Magnetorheological Polishing Fluid for Micro Mould Polishing

Nurain Abdul Mutalib¹, Izwan Ismail^{1,2,3*}, Sofarina M. Soffie¹, and Syarifah Nur Aqida Syed Ahmad^{1,2}

¹Faculty of Mechanical and Manufacturing Engineering, Universiti Malaysia Pahang, 26600 Pekan, Malaysia

²Automotive Engineering Centre, University Malaysia Pahang, 26600 Pekan, Malaysia

³Centre of Excellence for Advanced Research in Fluid Flow (CARIFF), University Malaysia Pahang, 26300 Gambang, Pahang, Malaysia

izwanismail@ump.edu.my

ABSTRACT

Complex surface features such as micro-grooves on micro mould which was produced by the micro-milling process have a significant problem of raised edge or top burr formation. This problem can be solved by using magnetorheological polishing (MRP) technique. MRP capable to produce ultra-fine three-dimensional profile structures. However, a tailored magnetorheological polishing fluid (MRPF) need to be used. This paper presents the effects of MRPF mixture components on their rheological properties. D-optimal mixture design of experiment was used to formulate the MRPF with various composition. The MRPF samples than analyzed using MCR Rheometer for rheological properties. It is found that each MRPF component composition has a significant effect on rheological properties. The result indicates that an optimum composition of MRPF to meet the MRP requirement is by having a volume percentage of carbonyl iron particle (CIP) and abrasive particles at 35% and 10% respectively. The finding of this study produced a significant statistical model of MRPF composition that beneficial for micro mould polishing technology.

KEYWORDS

Magnetorheological polishing; Micro mould; Rheology

DOI: https://doi.org/10.1007/978-981-15-0950-6_75

ACKNOWLEDGEMENT

This research was supported in part by Fundamental Research Grant Scheme (FRGS), Ministry of Higher Education, Malaysia FRGS/1/2016/TK03/UMP/02/12 (RDU160132).