Journal of ASTM International
Selected Technical Papers

ASTM INTERNATIONAL
Standards Worldwide

STP 1567

Nanofluids

JAI Guest Editor:
K. Narayan Prabhu

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ASTM International
100 Barr Harbor Drive
PO Box C700
West Conshohocken, PA 19428-2959

Printed in the U.S.A.

ASTM Stock #: STP1567

Library of Congress Cataloging-in-Publication Data
Nanofluids / JAI guest editor, K. Narayan Prabhu.
p. cm. -- (Journal of ASTM International ; STP 1567)
Includes bibliographical references and index.
ISBN 978-0-8031-7555-6 (alk. paper)
1. Nanofluids. 2. Nanotubes. 3. Lubricating oils--Additives. 4. Heat--Transmission.
I. Prabhu, Narayan.
TJ853.4.M53N36 2012
620.1'06--dc23 2012032066

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Printed in Bay Shore, NY
August, 2012

Foreword

THIS COMPILATION OF Selected Technical Papers, STP 1567, Nanofluids, contains papers highlighting the widespread properties of nanofluid technology including: heat transfer/thermal transport, composition, applications, preparation and characterization.

The STP Guest Editor is K. Narayan Prabhu, National Institute of Technology Karnataka, Surathkal, Mangalore, India.

Contents

Overview

Liquids containing nanometer-sized particles of metals, oxides, carbides, nanotubes etc., are called Nanofluids and have extensive applications as coolants in the electronic, nuclear, and heat treatment industries. The addition of nanoparticles to fluids also enhances the lubricating properties of oils and reduces vehicular emissions. Inspite of being an interesting field, the synthesis and development of nanofluids is hindered by the lack of a thorough understanding of the basic mechanisms of heat transfer, poor stability of nanofluids and lack of agreement between results reported by the scientific community.

The compendium on Nanofluids is an attempt to address the above issues. STP 1567 consists of eleven technical papers. The use of optimum CNT concentration and bath temperature for maximum heat transfer rate during quenching in CNT Nanofluids are discussed in the first paper. The second paper compares the performance of copper oxide nanofluid with water in electronic cooling. The experimental investigation on nanofluid boiling, flow visualization, critical heat flux enhancement, and transient characteristics are discussed in the third paper. Papers on preparation and characterization of surfactant coated Ce-Zr nanoparticles/nanofuel and reduction of emission in a diesel engine using nanofuel are included in the compendium. The paper by Khan discusses boundary-layer flow of a nanofluid past a stretching sheet under uniform heat and mass flux. The thermal conductivity and rheological behavior of Al-alloy dispersed ethylene glycol based nanofluids are discussed in a paper by Paul et al. The use of nanofluids in heat treatment industry are included in a paper that outlines the effect of addition of aluminum nanoparticles on cooling performance and quench severity of water during immersion quenching. The details of one step method of preparation of copper nanofluids are given in a paper on synthesis of copper nanofluids using ascorbic acid reduction method via one step solution phase approach. An interesting paper by Wang outlines the use of ultrasound thermometry to study the natural convection in opaque nanofluids. The nucleate pool boiling heat transfer correlation for TiO_2-water Nanofluids is discussed in the last paper.

I sincerely thank all of the authors for their contributions and sharing their knowledge. I am indebted to reviewers who have played an important role in the preparation of this STP by their useful suggestions and critical comments. I deeply appreciate the timely assistance and the excellent coordination of the review work by ASTM and JAI staff members. It was wonderful to work and interact with them. I am grateful to Prof. George E. Totten of GE Totten & Associates, LLC, USA who conceived the idea of STP

on Nanofluids and inspired, encouraged and mentored me to complete this work. As Guest Editor, I earnestly hope that this STP will encourage and facilitate further research in the nascent and wonderful field of Nanofluids. This compendium of research papers should serve as a valuable resource for students, researchers, and process engineers in nuclear, electronic, heat treatment and other industries where nanofluids are being used.

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ISBN: 978-0-8031-7555-6
Stock #: STP1567