



EDITOR-IN-CHIEF'S WORD

Dear readers,

It is with great satisfaction that I present this issue of *Engineering Power*, which reflects the Croatian Academy of Engineering's commitment to promoting excellence in engineering research and innovation. Scientific and technological progress depends on the continuous exchange of knowledge, interdisciplinary collaboration, and the dedication of researchers who seek solutions to contemporary challenges.

The papers presented in this issue demonstrate the importance of engineering sciences in advancing materials, technologies, and processes that contribute to safety, sustainability, and quality of life. By fostering the dissemination of scientific achievements, *Engineering Power* serves as a platform for connecting researchers, industry professionals, and the wider engineering community.

I would like to express my sincere appreciation to the authors, reviewers, editors, and all contributors whose efforts make the publication of this journal possible. Their expertise and commitment ensure the high quality and relevance of the work presented.

I invite you to explore this issue and trust that the insights it offers will inspire further research, innovation, and collaboration.

Editor-in-Chief

Vedran Mornar, President of the Croatian Academy of Engineering



EDITOR'S WORD

Dear readers,

It is my great pleasure to present the new issue of *Engineering Power*, edited by Prof. Anita Tarbuk, PhD, chairperson of the HATZ Committee for International Cooperation. In this issue, you can read about the comparative analysis of protective garment systems, the impact of silicone products on the properties of reference polyester fabrics, and the antimicrobial effectiveness of zeolite-treated leather. I hope you enjoy reading this issue.

Editor

Bruno Zelić, Vice-President of the Croatian Academy of Engineering



FOREWORD

Dear readers,

This issue of *Engineering Power* presents recent research in textile and leather engineering through three original scientific papers, highlighting significant advances in thermal protection, antimicrobial treatment, and finishing and care processes aimed at improving performance, durability, and user comfort.

The first study reports measurement results and a comparative analysis of the thermal insulation properties of protective garment systems (PGS). Both systems were made from identical materials, differing only in the removable thermal inserts: one made of fleece and the other of spacer material. Thermal properties were evaluated using a thermal manikin. The results confirmed that the laminate outer shell primarily provides protection against wind and moisture, while the removable thermal inserts are the main contributors to thermal insulation. The increase in total insulation to approximately 2.3 Clo is more than double the thermal insulation of protective garments without the inserts.

The second study examined the effects of silicone products on the properties of reference polyester fabrics. Red, blue, and white reference polyester fabrics were washed with a standard detergent at 60 °C and then treated with modified polydimethylsiloxane (PDMS) products from two manufacturers. Spectral and surface analyses showed that neither washing nor after-treatment reduced the whiteness of the white fabric, which is considered favorable. However, silicone products affected the color fastness of the blue and red fabrics, with product B having a stronger effect than product A. Both PDMS treatments also reduced the surface friction coefficient compared to detergent-washed fabrics. Differences in the surface kurtosis parameter (Rku) were observed between red and blue samples and between the two silicone products, A and B.

The third study examined leather processing and antimicrobial protection. Leather quality largely depends on preparatory steps such as soaking, liming, deliming, bating, and pickling, which ready the material for tanning. Because microbial growth during storage can disrupt production and raise costs, this research explored a more environmentally friendly approach by treating pickled leather with zeolites. Leather samples treated with zeolites were tested against microorganisms – *Candida albicans*, *Staphylococcus aureus*, and *Escherichia coli* – and compared to standard pickled leather. The results confirmed the antimicrobial effectiveness of zeolite-treated leather, demonstrating its potential for safer and more sustainable leather storage.

These three original scientific papers are thematically aligned with the strategic programs of the European Technology Platform for the Future of Textiles and Clothing (Textile ETP) and the Research Strategy of the University of Zagreb Faculty of Textile Technology for the period 2021–2027 demonstrate how innovative material treatments and finishing technologies can significantly improve the functional and protective properties of textiles and leather products.

Guest Editor

Anita Tarbuk, University of Zagreb, Faculty of Textile Technology