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# *„Development of manufacturing technology for innovative surface care and polishing agents based on functional polysiloxanes”*

## Abstract

The rapid development of material technologies and increasing consumer expectations present the chemical industry with the challenge of creating innovative products that combine high functionality, aesthetics, and durability. In particular, surface care and polishing formulations have gained significant interest due to their role in protecting and enhancing the appearance of various materials. These products must ensure excellent gloss, long-lasting protective layers, and resistance to environmental factors while also being easy to apply and highly effective.

This doctoral dissertation focuses on developing innovative surface care and polishing formulations based on functional polysiloxanes and natural waxes. The primary goal was to establish an efficient technology for manufacturing aerosol-based formulations and prepare them for market implementation.

The research involved a detailed analysis of the physicochemical properties of natural wax solutions, including beeswax, carnauba wax, and rice bran wax, combined with polysiloxane additives. Their impact on key performance parameters—such as gloss, coating durability, hydrophobic effects, and anti-slip properties—was evaluated. Based on these findings, optimal ingredient ratios were selected to ensure stability and high performance. The protective layers obtained were also analyzed in terms of their surface morphology and microscopic distribution on treated surfaces. The next phase of the research focused on developing the aerosol packaging technology, analyzing formulation compatibility with packaging materials, and selecting suitable propellants and spraying systems. Practical application tests were conducted to assess the formulations' effectiveness under real-world conditions, alongside stability studies confirming their durability over extended storage periods. Finally, a pilot-scale manufacturing process was developed to enable the industrial implementation of the proposed solutions.

This dissertation makes a significant contribution to the development of advanced surface care formulations characterized by high efficiency and broad application potential. The proposed solutions address current market demands and serve as a foundation for further refinement of commercial formulations and their large-scale production.