Editorial

Special Issue: Road Materials and Sustainable Pavement Design

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The study of pavement sustainability encompasses the environmental, economic, and societal impacts of pavements throughout their life cycle [1–3]. The sustainability of pavements is heavily influenced by material choices, which impact durability, resource usage, safety, life-cycle costs, maintenance approaches, and environmental considerations [4–6]. Recent research has focused on advances in road materials for sustainable pavement practices [7,8]. However, the question of sustainability in pavements presents a complex array of challenges, many of which remain unresolved.

The aim of this Special Issue is to collect and present breakthrough research on the current trends in sustainable road materials and pavement design, including but not limited to the following themes: recycled pavement materials, modified asphalt materials, industrial waste for road construction, the multi-scale modeling and performance evaluation of road materials, the impact of roads on the environment, durable pavement materials and structures, and life-cycle assessments of pavements.

A total of twenty papers (nineteen research papers and one review paper) in various fields involving road materials and sustainable pavement design, including road material properties, pavement management, structural evaluation, pavement design, and asset management, are presented in this Special Issue. Yu et al. (contribution 1), Lei et al. (contribution 2), and Jimenez-Relinque et al. (contribution 3) report that additive materials such as magnetite powder, modified polyurethane, or photocatalysts can enhance the properties of road materials and extend the durability of road surfaces. Wang et al. (contribution 4), Chen et al. (contribution 5), Xie et al. (contribution 6), Yang et al. (contribution 7), Rojas et al. (contribution 8), and Chen et al. (contribution 9) evaluate the slip resistance, fracture properties, sound absorption properties, rheological properties, permeability properties, and thermal conductivity of road materials through experiments and numerical simulations. Plati et al. (contribution 10) report that the use of reclaimed asphalt pavement (RAP) for admixture in unbound layers is feasible and meets the sustainability requirements of pavement materials and structures without compromising the pavement strength. Mikolaj et al. (contribution 11) present a complex pavement management system method being implemented and tested by the Slovak Road Administration. Justo-Silva et al. (contribution 12) report the utilization of AASHTOWare Pavement-ME® for flexible pavements on Portuguese national roads, highlighting its capacity for designing new pavement structures, evaluating performance, and facilitating efficient maintenance and rehabilitation planning. Ji et al. (contribution 13) have investigated the mechanical and micro-interfacial properties of recycled concrete via the finite element (FE) model, which provides a reference for the utilization of industrial waste. Zhao et al. (contribution 14), and Király et al. (contribution 15) report the impact of dynamic loads on reflective fatigue and analyze static and dynamic tire–pavement interactions. Wenzel et al. (contribution 16) and Lee et al. (contribution 17) report the use of 'premium' glass beads, enhanced with TiO_2 and synthesized through a proprietary process, and identify the road marking system characterized by the lowest long-term consumption of resources. Sedivy et al. (contribution 18) have utilized 20 years of

non-destructive data collection and mathematical modeling, including sensitivity analysis with Pearson's coefficient, to create valuable road degradation functions for enhancing pavement design quality. Li et al. (contribution 19) propose an elastoplastic constitutive model to study the elastoplastic properties of unbound granular materials (UGMs) under repeated vehicular loads. This model has the advantage of describing the calculation process of plastic strain under repeated loads. Wang et al. (contribution 20) review morphometric measurements, characteristic parameters, and visualization techniques for road aggregates, highlighting challenges in accurate measurement and the need to consider aggregate evolution in dynamic loading scenarios.

Although submissions for this Special Issue are now closed, further in-depth research in the field of road materials and sustainable pavement design will continue to address the challenges that we face today, such as material recycling, carbon neutrality, and pavement longevity.

Author Contributions: Conceptualization, K.Y. and J.X.; investigation, K.Y.; data curation, J.C. and J.X.; writing—original draft preparation, J.C.; writing—review and editing, J.C.; visualization, K.Y. and J.X. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The author declares no conflicts of interest.

List of Contributions

1. Yu, W.; Zhang, L.; Miao, Y.; Gong, Z.; Wang, S. Microwave Sensitivity Enhanced Asphalt Mastic with Magnetite Powder and Its Performance after Microwave Heating. *Appl. Sci.* **2023**, *13*, 8276. https://doi.org/10.3390/app13148276.
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