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Special Issue Reprint

Advanced Production, Processing and Characterization of Industrial Materials

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This Special Issue Reprint presents recent advances in the production, modelling, processing, and characterization of advanced industrial materials, encompassing metallic, polymeric, composite, and nanostructured systems. The contributions address fundamental challenges in materials science, including surface integrity assessment, development of novel machining and manufacturing approaches, and optimization of thermoplastic composite consolidation, while also providing rigorous insights into additive manufacturing processes, rheological behaviour, and constitutive modelling. Several studies focus on state-of-the-art metrology and characterization techniques, such as optical and fluorescence methods and X-ray scattering, applied to the investigation of nanoparticles, microstructures, and thermal properties. Further research examines the welding of dissimilar steels, binder jetting of stainless steel, and the influence of heat treatment on functional steel performance, alongside sustainability-driven investigations of natural-fibre-based energy devices and bio-derived polymer composites. Additional topics include defect structures in doped crystals, low-temperature synthesis of oxide films, and the mechanical response of steels under extreme service conditions. Together, these contributions demonstrate the integration of experimental methodologies, computational modelling, and industrial relevance and provide a concise overview of current trends and emerging research directions in material reliability, surface engineering, and advanced manufacturing technologies.



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