WOOD-PLASTIC COMPOSITES

ANATOLE A. KLYOSOV

WILEY-INTERSCIENCE
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The book is targeted for multidisciplinary scientists and engineers dealing with wood-plastic composites, material science, cellulose, polymers, minerals, strain and stress, flammability, microbiology, rheology, plastic technology, as well as graduate-level students in these disciplines.

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PREFACE

This book is by no means a comprehensive review of wood-plastic composites. Such an imaginary gigantic volume, or, rather, a set of volumes would be extremely boring, overloaded with little and unnecessary details, and would largely duplicate a great many books and papers on plastics, particularly in descriptions of compounders, extruders, downstream equipment, and other machinery.

My initial goal was to present a series of assays in the field of wood-plastic composites, which were supposed to bridge a gap between the laboratory-based research and testing and the real world, real decks, and real railing systems made of wood-plastic composite (WPC) materials. I was fortunate to spend a number of—I hope—productive years being a head of Research and Development division and Vice President, R&D of a company which first had a name Thermo Fibergen, then Kadant Composites, and then LDI Composites, manufacturing GeoDeck WPC decking and railing systems. We have gone both through the highs of our professional achievements, such as when our product was awarded the "Best Buy" status by a major U.S. magazine, and through the lows, when several years ago we voluntarily recalled many trackloads of suspect composite boards from distributors of our product. We have a thing or two to say about wood-plastic composites, about a road to success and a road to failure.

A manufacturing company like ours generates a wealth of knowledge, particularly when works along with many other experts in the field. We have all four great components in our work in order to absorb, digest, and generate knowledge: we research and develop WPC composites in the lab, we manufacture them, sell them, and install them in the real world. And, as a reward, we have a feedback from the field, on how our product performs. If an academic researcher, reading it, is jealous,

I can understand this. I myself was an academic researcher most of my life, including many good years at Harvard University.

So, having an academic experience in the fields of chemistry and biochemistry, and then having acquired an experience in engineering, strain and stress, material science, and, first and foremost, in keeping focus on priorities of the market, hence, on priorities of manufacturing, troubleshooting and problemsolving, and translation of these priorities back into research and development, I decided to share these experiences with a wider audience. A wider, compared with the audience I rather frequently meet at professional meetings, conferences, symposia in the area.

This book is focused on "substance," that is, on wood-plastic composites and their properties, their behavior, rather than on means to manufacture them. I have soberly decided not to describe machinery, "hardware" in WPC manufacturing, because there are countless volumes in which the machinery is described in detail. Generally, as I see it, there is no principal difference between that machinery in the plastic industry and that of wood-plastic composites. Who thinks otherwise, seven feet under the keel and a favorable wind, and welcome to write a textbook or a monograph on the subject.

The choice of chapters for the book was very simple—all the seventeen topics were those which were of a great interest to colleagues of mine and myself when we were working on wood-plastic composites. All these topics seriously determine aesthetics, properties, performance, durability of wood-plastic composite products, and/or processabilty of the material.

By the time the book was submitted for publication, there was not a single volume on the market which would have the subject covered. The material is either scattered in multiple proceedings of WPC and related conferences and symposia, or published as separate papers in professional and semiprofessional editions. Hence, this might be the first try to collect the topics under a single cover, and I am fully responsible for it.

As a reader would notice, many features of wood-plastic composites are illustrated with GeoDeck decking and railing products. This is not a sales pitch but a reality because, as one knows, manufacturing companies very seldom publish data on their products, particularly in comparison with the competition. I have collected as many data published on commercial WPC as I could, including data provided by the manufacturer in their commercial literature and on their websites, and they are described in this book. We generated other data in our laboratory, using commercially available wood-plastic composite products. In many cases, when publication of data could have hurt the image of the manufacturer, I did not indicate the brand name and hid it under a number. I testify that the purpose of the book is not to show which material and product is better (there is no a universally better WPC product compared to competition), but to show a range of properties and explain why such a range exists.

The book would not appear without close cooperation with my co-workers who are too many to name them all. I would like to specially thank here Alan James, Dr. Tatyana Samoylova, David Leeman, Dr. Yiannis Monovoukas, Jonathan Painter, Steve Anderson, Mikiko Kubala, Matt Beachler, Brian Betz, Brent Gwatney, Lanny

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ANATOLE A. KLYOSOV
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