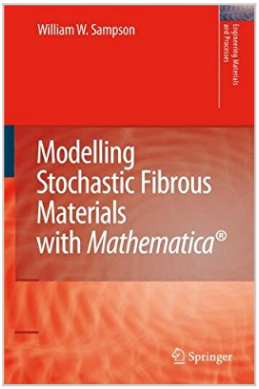

Modelling Stochastic Fibrous Materials with Mathematica® (Engineering Materials and Processes)

By William Wyatt Sampson

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Developments in the use of electrospun fibrous materials, for application in tissue engineering and in carbon fibrous materials in fuel cells, has generated new interest in the dependence of the properties and structure of these materials on those of their constituent fibres. “Modelling Stochastic Fibrous Materials with Mathematica” provides an overview of the structure of stochastic fibrous materials, and the use of Mathematica® to develop models describing their structure and performance. The book introduces the techniques of statistical geometry and probabilistic modelling for non-mathematicians, and assumes no previous experience of Mathematica®. Using accessible notation and by providing examples of Mathematica® code, expressions are derived for the structural characteristics of stochastic fibrous materials providing insights into the ways these depend upon each other and the extent to which they can be modified in the laboratory or in a manufacturing environment.

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Editorial Review

Review

From the reviews:

"This book provides an overview of the structure of stochastic fibrous materials, and the use of Mathematica code to develop models describing their structure and performance. … This well-written book is a reader-friendly and good-organised manual in the field of composite materials. It can be highly recommended to experts in mechanics of solids, engineers, and to graduate, postgraduate and doctoral students." (Igor Andrianov, Zentralblatt MATH, Vol. 1166, 2009)

From the Back Cover

Recent developments in the use of electrospun fibrous materials, for application as scaffolds for tissue engineering and in the application of carbon fibrous materials in fuel cells, has generated new interest in the dependence of the properties and structure of these materials on those of their constituent fibres. *Modelling Stochastic Fibrous Materials with Mathematica*® provides an overview of the structure of stochastic fibrous materials, and the use of *Mathematica*® to develop models describing their structure and performance.

Modelling Stochastic Fibrous Materials with Mathematica® provides an introduction to the techniques of statistical geometry and probabilistic modelling for non-mathematicians, and assumes no previous experience of *Mathematica*®. Using accessible notation and by providing examples of *Mathematica*® code, expressions are derived for the structural characteristics of stochastic fibrous materials, providing insights into the ways these depend upon each other and the extent to which they can be modified in the laboratory or in a manufacturing environment.

Modelling Stochastic Fibrous Materials with Mathematica® is a valuable resource for researchers and engineers in the paper and non-wovens industries and for those applying non-woven fibrous architectures in composites, fuel cells and filtration applications. The text is highly relevant also to researchers developing applications for electrospinning technologies.

A trial version of *Mathematica*® 6.0 can be downloaded from http://www.wolfram.com/books/resources, by entering the licence number L3250-9882. *Mathematica*® notebook files containing the code presented in each chapter can be downloaded from http://www.springer.com/978-1-84800-990-5.

About the Author

Bill Sampson is a Senior Lecturer in the School of Materials at the University of Manchester, with more than 15 years experience modeling the structure and performance of stochastic fibrous materials. His interest in these materials developed at UMIST and the University of Toronto where he first used the computer mathematics software *Mathematica* to develop theories applying statistical geometry to the study of the pore size distribution in paper. Subsequent work has yielded theories describing the distributions of porosity and pore size in two- and three-dimensional networks, and the extent and configuration of fiber contacts in general classes of stochastic fibrous materials. These models have been applied to the study of the structures

of non-woven textiles, electrospun polymer networks, and fibrous filters, and the influence of structure on their mechanical, optical and transport behaviors.

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