Acoustic Absorbers and Diffusers Theory, Design and Application — Third Edition
Trevor J. Cox and Peter D'Antonio
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Until 2004 there was no single textbook dedicated to the theory of acoustic materials, other than the Kosten and Zwikker book *Sound Absorbing Materials*, published in 1949. *Acoustic Absorbers and Diffusers Theory, Design and Application* is the third edition in 12 years of this inclusive text. All chapters have been updated with this edition. New topics include sustainability, fast time-domain models for diffusers, current measurement standards and improved techniques for prediction of porous absorbers, sound reflecting surfaces and diffusers. Most prediction methods in the book are linked to downloadable MATLAB® scripts.

Like earlier editions, the book provides both practical and theoretical aspects of sound absorbing and diffusing surfaces. Chapters are presented in a narrative format before introducing the modeling methods. Each chapter concludes with an extensive reference list for those desiring more information.

The authors are eminently qualified to write about the topics covered in this book, having worked independently and together in developing the theory of numerically derived sound diffusing surfaces. Trevor Cox is Professor of Acoustic Engineering at the University of Salford (UK) where he has conducted research on scattering provided by optimized sound diffusing surfaces. Peter D'Antonio was founder of RPG Diffusor Systems, Inc., a manufacturer of commercial sound diffusing and absorptive products.

Chapter 1 contrasts absorption versus diffuse sound reflections. Sustainability of materials used to manufacture sound absorptive and diffusive products is reviewed.

Applications and principles of sound absorbing materials are covered in Chapter 2 to include modal and specular reflection control. Non-architectural acoustic considerations describe enclosures, barriers, automotive and loudspeaker applications for sound absorbing materials.

Chapter 3 covers principles and applications of sound diffusing surfaces to include studios, stages, auditoria and sound field coloration in small rooms.

The measurement of sound absorptive properties is the subject of Chapter 4. Topics include impedance tube, two-microphone techniques, in-situ and reverberation chamber measurements and evaluating internal physical properties of sound absorptive materials.

Chapter 5 covers measuring sound diffusive surface properties with primary emphasis on the diffusion and the scattering coefficients to include the evolution, measurement and prediction of these metrics.

Absorption mechanisms of different porous materials are described in Chapter 6. Included are modeling sound propagation within porous materials and predicting surface impedance properties.

Chapter 7 addresses resonant absorbers of various types, their design equations and resonant frequencies. Unique constructions and advances in material technologies are described.

Non-standard sound absorbers are covered in Chapter 8 to include audience and seating, Schroeder diffusers and absorption by vegetation.

Chapter 9 reviews in considerable detail the theory of sound reflection and scattering using frequency and time domain models to include boundary element, Fraunhofer, Fourier and finite difference time domain methods. A useful table that describes which technique is the most appropriate for the intended analysis is included.

Schroeder diffusers are the subject of Chapter 10. Topics covered include sequences, periodicity and modulation, absorption, and optimization for one dimension sound diffusing surfaces.

Chapter 11 covers geometric sound diffusers starting with plane surfaces, progressing to triangular and curved surfaces, and optimization to enhance diffusion and prevent sound focusing.

Hybrid surfaces, those that include varying impedance and shaping, are described in Chapter 12. These surfaces can provide sound absorption and scattering in both one and two dimensions depending on the surface geometry.

Chapter 13 discusses the transition from surface acoustic properties to room acoustic predictions using geometric room acoustic models and how sound absorber and diffuser acoustic properties should be applied. A primary focus is on the application of sound absorption coefficients obtained by various methods and the use of scattering coefficients applied to surfaces.

The book concludes with Chapter 14 covering active sound absorbers, those using some form of loudspeaker and control system. The advantages of this technology for controlling selected low frequency sound are described as are technological problems which have limited its application.

This revised edition consolidates the research and theory of acoustic materials known to date and will be a valuable resource for acoustic researchers, consultants and acoustic product manufacturers. I would also expect acoustic standards committee members to find useful information for consideration in future standards revisions relating to acoustic materials measurement. The publishers have created a quality book with easy-to-read text fonts, uniformly formatted equations, distinct line art and clearly reproduced photographs. If you have an earlier edition, as I do, there is sufficient new material in this edition to recommend purchasing this reference volume.

Lastly, I would like to see the publisher award a prize to the reader who can correctly identify first the six acoustic researchers that appear on the book's cover.

Neil Thompson Shade
Acoustical Design Collaborative, Ltd.
Peabody Institute of Johns Hopkins University
nts@akustx.com