

Sound Materials

A Compendium of Sound Absorbing Materials for Architecture and Design
by Tyler Adams

Tyler Adams navigates the field of sound absorbing materials to present the definitive resource guide.

Sound Materials is the first publication of its kind dedicated to sound absorbing materials, with inspiring real-world applications illustrated in parallel. Vital reading for architects, designers and creative professionals, the book showcases over 100 materials in a variety of interior design and architectural contexts. The featured projects – from leading architects and designers such as OMA, Gehry Partners, Foster + Partners, Ronan and Erwan Bouroullec, and Barber & Osgerby – underscore some of the common acoustical and material challenges presented by specific applications, such as healthcare, education, performing arts, office, retail and industrial environments.

Fundamental technical concepts are clearly and concisely presented to provide a general understanding of how materials absorb sound and how these materials are commonly used to reduce noise and reverberation, inform our sense of space, and improve communication in everyday environments. This book not only surveys an extensive range of materials past, present and emerging, but also highlights many exciting opportunities for future innovation and collaboration at the intersections of acoustical engineering, materials science, design and architecture.

A special chapter is devoted to interviews with designers and engineers who work with sound absorbing materials in novel and innovative ways, with topics including historic preservation, wayfinding for the blind, digital modelling and fabrication, interior design and emerging high-tech materials.

Features

- Details over 100 fascinating sound absorbing materials – past, present and emerging – and their applications in interior design, product design and architecture.
- The material descriptions strike a balance so as to speak to as broad of an audience as well as possible yet still appeal to seasoned professionals.
- Numerous interviews are included with designers and engineers, exploring how materials are created and utilised to solve design problems.
- The first publication of its kind dedicated solely to sound absorbing materials, making this reference book a definitive resource that readers will want to regularly access and refer to throughout their careers.
- Vital reading for architects, designers, acousticians, engineers, students and creative professionals.

Publication Details

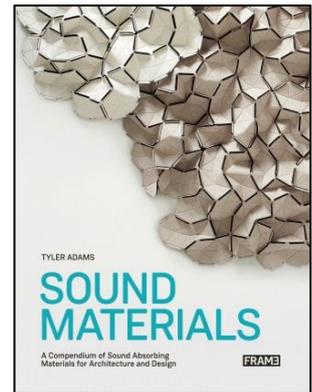
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About the Author

Tyler Adams is an acoustical engineer based in Los Angeles, California. He holds a Master of Science in Architectural Acoustics from Rensselaer Polytechnic Institute and is a member of the Acoustical Society of America and the Institute of Noise Control Engineers. As an acoustician, he has consulted on a variety of projects, including schools, hospitals, offices, high-rise buildings, research laboratories, performance spaces and environmental noise.

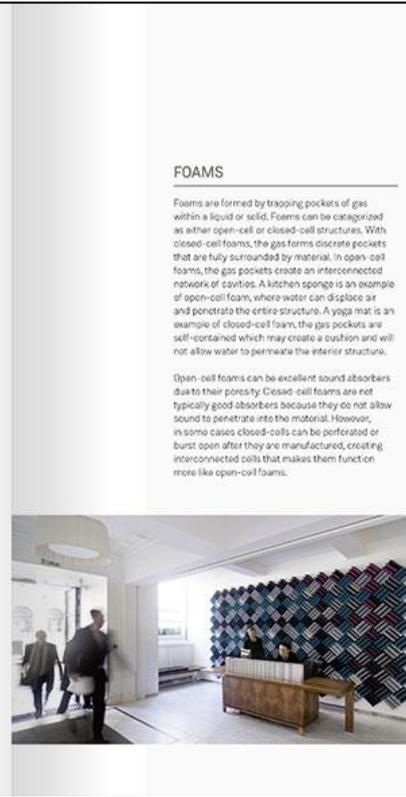
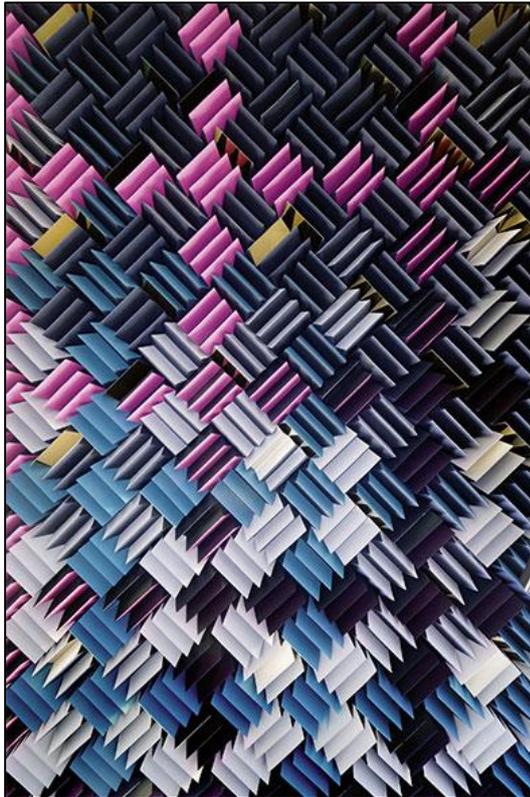
About Frame Publishers

Best known for the production of *Frame* magazine, Frame Publishers also has a vast portfolio of books aimed at design professionals and students. These include architecture and interior design titles, plus materials-focused books – including the best-seller *Materiology*. Recent releases include *CMF Design* and *Spaces for Innovation*, as well as new editions of *Goods*, *Grand Stand*, *Night Fever* and *Powershop*.



Contact: For high resolution images and further information (including requests for author interviews and details of planned media events), please contact Ilaria Capriglione: press@frameweb.com

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FOAMS

Foams are formed by trapping pockets of gas within a liquid or solid. Foams can be categorized as either open-cell or closed-cell structures. With closed-cell foams, the gas forms discrete pockets that are fully surrounded by material. In open-cell foams, the gas pockets create an interconnected network of cavities. A kitchen sponge is an example of open-cell foam, where water can displace air and penetrate the entire structure. A yoga mat is an example of closed-cell foam, the gas pockets are self-contained which may create a cushion and will not allow water to permeate the interior structure.

Open-cell foams can be excellent sound absorbers due to their porosity. Closed-cell foams are not typically good absorbers because they do not allow sound to penetrate into the material. However, in some cases closed-cells can be perforated or burst open after they are manufactured, creating interconnected cells that makes them function more like open-cell foams.

Acoustic, designed by ECR, St. James's, London (2015). The installation in the foyer of a building in Waterloo Place is crafted from 700 brightly-colored foam wedges, inspired by anechoic chamber. The wedges attenuate the reverberation time within the space and provide an infrastructure for a changing geometric pattern which references the area's rich history of banking. As visitors to the building traverse the reception area, the appearance of the piece subtly shifts revealing two alternating colorful wave patterns, depending on the point from which it is viewed.

FOOBUS #7

The material descriptions strike a balance so as to speak to as broad an audience as possible, yet still appeal to a seasoned professionals or serve as an educational resource for a college course.



Above: Textile Softwall illuminated internally with LEDs.

Opposite Above: Softwall in pale pink textile, kraft paper, and blue textile.

Opposite Below: Cloud Softlight Mobis, internally lit by LED.

MOLO SOFTWALL

Softwall and Softblock, by molo, are free-standing, pleated partition systems designed for subdividing spaces. The vertical pleats provide stiffness and allow the material to expand, contract, and curve. The product is constructed from either kraft paper or a non-woven polyethylene textile, commonly known as Tyvek. The Tyvek material offers a paper-like appearance that is translucent, can be dyed, and is tear, UV, water, and flame resistant. Kraft paper and Tyvek are not porous materials, so sound absorption occurs due to diaphragmatic movement of the many thin-walled cells created by the honeycomb pleats.

The Softwall system is modular and units can be attached and held together with small magnets. A number of accessory components have been designed by molo to integrate into the partitions such as LED lighting and seating. Acoustic tests of the softwall have achieved NRC ratings between 0.45-0.60. The pleated Tyvek designs have also been extended to lights, mobiles, and pendants, called Softlight, which have also been tested for sound absorption.

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It provides context, examples, inspiration and direction to help users explore and understand the various options and applications of sound absorbing materials.

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ACOUSTICAL METAL DECK

Metal deck is a versatile building material that can be used for the construction of lightweight roofs or as a composite system for creating poured concrete floors and ceilings. In lightweight roofing applications, metal deck can be flat, pitched, or vaulted into complex forms.

Metal deck is often left exposed as an interior finish. There are a variety of options available in terms of profile dimensions and aesthetic appearance. Metal decks are commonly available with an acoustic option by incorporating a porous absorber behind perforated metal.

With a corrugated deck profile, absorptive material typically fills the flutes, which are perforated along the sides. Cellular type metal decks have flat perforated faces and the absorption fills the cell cavity. Perforated flutes tend to perform less efficiently than the flat surface of perforated cellular deck, particularly at high frequencies. This is because at certain angles of incidence, the sound waves do not enter the flute perforations and are reflected.

The absorption performance of acoustical decks typically ranges between NRC 0.5-0.9. One of the primary benefits of using acoustical metal decking is that acoustic absorption is uniformly integrated directly into the building structure with a single product. Furthermore, the absorption is hidden from view and protected from damage by the perforated metal facing.

Acoustical metal deck profile options from the manufacturer Epic Metals, from top to bottom: Tera CA, Tera S-5A, Wolock W95, Wolock W10A, Super Wideck.



Goodes Hall, Queen's University School of Business, Kingston, Ontario, designed by The Architects Group (2013). The project expanded upon an existing historic Richardsonian Romanesque school house from the late 1800s and introduced a new atrium along the heritage building's west side. The atrium features an amphitheatre style design with tiered seating that encloses the university commons. A lightweight roof, composed of an acoustical metal deck (Epic Metals) by Epic Metals), controls reverberation and supports a variety of functions such as lectures, presentations, public congregation, or quiet study.



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The 100+ materials compiled in this book are divided into five categories: Porous, Facings, Resonant, Micro-Perforated and Historical.



ANNE KYRÖ QUINN

London based designer Anne Kyrrö Quinn works at the intersection of design, craft, and art, creating custom-made, hand-fabricated, architectural textile wall installations. Her work is known for its highly graphic, three-dimensional construction, bold colours, richly textured surfaces, sculptural silhouettes, and minimalist motifs.

Your background is in textile design. How did you become involved in creating acoustical treatments?

While I was a textile design student, I experimented with many different materials including felt – I found the material very inspiring. Subsequently, I started using more and more felt in my designs and settled on 100 per cent wool felt as being the best material to form my sculptural textile structures. I also like felt because it is natural, durable, and versatile, which makes it an ecologically sound choice.

A custom designed wall feature for the auditorium of the 2015 100% Design Fair, London, UK.

After a number of different projects creating decorative textile wall hangings and feature walls, my clients noted the sound-deadening, calming quality in the places where the pieces were installed. So we decided to get various designs tested to find out the sound absorption coefficients of the designs. The designs were thoroughly tested and classified in accordance with International Standards (ISO) 354 and 116-54. The tests proved the designs were ideal for spaces where noise control and reduction is a concern. The test results also gave us a good base line to further develop and research techniques to improve the acoustic performance of the 3D textile creations. This led me to further study architectural acoustics at London South Bank University's Acoustics Department.

We started on the basis that the textile structures we designed should look good and function on an emotional level. Most acoustical products, at least at that time,

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Readers gain insight from expert interviews – with designers and engineers presenting the aesthetic possibilities of sound absorbing materials, including how they can be used to define our impression of spaces or how they help to emphasise spatial contrasts.



'This book will encourage conversations between designers and engineers and in a small way advocate for greater consideration of, and enthusiasm for, acoustics in the design of everyday objects and environments' – Tyler Adams

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