Natural Textile Modified by Magnetic Nanoparticles for Acoustic Mats

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Abstract. Magnetic nanoparticles exhibit significant potential as sonosensitizers. It makes them highly effective in enhancing ultrasound applications. Research demonstrates that doped tissue-mimicking phantoms exhibit increased sound attenuation and heat generation, compared to pure agar phantoms - a result of interactions between ultrasonic waves and nanoparticles.

Nanoparticles can also influence audible range sounds by incorporating them into textiles. These smart textiles, modified with magnetic materials, respond to external stimuli, such as magnetic and electric field. Additionally, they may demonstrate potential in influencing acoustic insulation. Excessive noise, a known health hazard, emphasizes the critical need for innovative sound-absorbing materials, which should ideally be lightweight, flexible, adaptable and sustainable.

We propose the use of mats embedded with nanoparticles for providing additional acoustic insulation. We have measured acoustic properties of various natural textiles covered with different number of modifying layers. The results show that the presence of magnetic particles improves the acoustic characteristics of mats, depending on their internal structure. The combination of magnetic nanomaterials and natural textiles makes them promising candidates for multifunctional applications, such as acoustic and electromagnetic shielding.

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