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Reconfigurable acoustic metamaterials for traffic noise reduction

Researchers at Purdue University have developed a lightweight noise barrier that can effectively mitigate traffic noise. The barrier adapts its acoustic properties in real-time to varying traffic noise frequencies, offering enhanced adaptability. Moreover, the design reduces structural load and simplifies installation while still providing effective noise mitigation. Traditional barriers, such as vertical walls, have several drawbacks, as they are heavy, costly to construct, and block airflow and light. This innovative design developed at Purdue instead offers tunable acoustic attenuation properties, making it suitable for reducing complex traffic noise patterns. The design's flexibility enables both light and airflow to pass through the material and promotes seamless integration into existing products.

Technology Validation:

Analytical and numerical studies demonstrated that the reconfigurable sonic barrier can be optimized for specific traffic noise frequencies: a 55-degree folding angle with a square lattice configuration effectively mitigated low-frequency noise around 500 Hz, while a 70-degree folding angle with a hexagonal lattice configuration was effective for higher frequencies around 1000 Hz.

Advantages:

-Lightweight

-Tunable acoustic attenuation properties

-Precise control of noise mitigation in different frequencies

-Permeable to light and airflow

-Provides greater flexibility compared to static barriers

Applications:

-Traffic noise reduction

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Category
Infrastructure & Construction/Structural Health Monitoring

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-Urban noise pollution

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