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Wave Attenuation Using 2-D Hierarchical Elastic Metamaterial Plates

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Metamateriais are artificial structures designed to achieve performance over static or dynamic conditions that usual materials would not be able to accomplish. Hierarchical parameters associated with the metamaterials can enhance even more their convenient properties, such as vibration control, and wave attenuation. The purpose of this work is to investigate the bandgap formation in hierarchical metamaterial Kirchhoff-Love thin plates with attached resonators. Different cases of homogeneous plate with hierarchically resonators following arithmetic, geometric, and Fibonacci progressions in the position and mass are studied. The plane wave expansion (PWE) and extended plane wave expansion (EPWE) approaches are used to calculate the band structure of the system. Numerical analyses are conducted. The bandgaps opened by the hierarchical metamaterial seems to present broader frequency ranges, which can improve the attenuation performance.