

Floquet-Bloch Waves Photonic Crystals with Absorption

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We consider light propagation in one-dimensional photonic crystals with absorption. The solutions of the wave equation are represented in terms of two Floquet-Bloch waves. In case of absorption, the Floquet multipliers and the Bloch wave number associated with those waves become complex for all frequencies of the propagating light, which makes difficult to separate the frequency spectrum into allowed bands and bandgaps. To address the issue, we investigate the dependence of the Floquet multipliers on frequency (wavenumber) in a complex plane. Then, the relation between the Bloch wave number and the multipliers for the absorptive case is established. As a consequence, this relation is also clarified for the bandgaps of lossless (non-absorptive) crystals. The obtained results should facilitate the proper parameterization of the transfer matrix for the absorptive crystals as well as for the bandgaps of lossless crystals.

REFERENCES

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