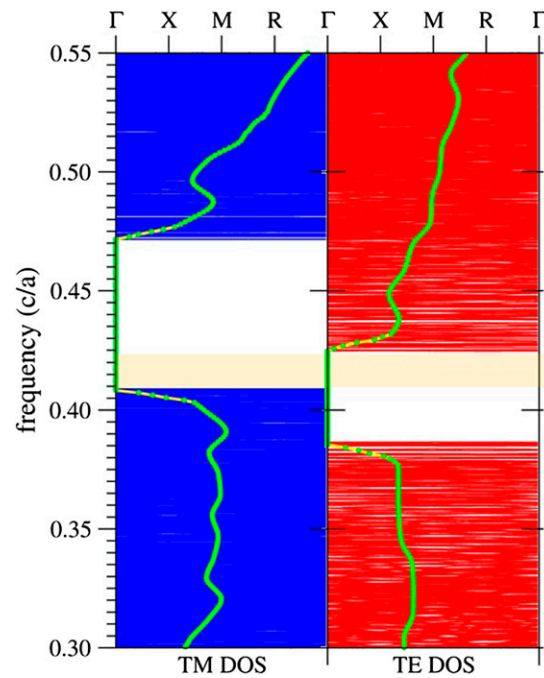


# Supporting Information

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**Fig. S1.** Simulations of transverse magnetic (TM; *Left*) and transverse electric (TE; *Right*) band structure (blue and red curves) and density of states (DOS; green curve) for the hyperuniform structure shown in Fig. 1A. The gaps are identified as the region where the DOS is zero. The complete band gap region is shown by the peach-colored area. The photonic band gaps shown are equivalent to the fundamental band gap in periodic systems. For example, the spectral location of the TM gap in our structure is determined by the resonant frequencies of the scattering centers and always occurs between band  $N$  and  $N + 1$ , with  $N$  precisely the number of cylinders per supercell. Similarly, for TE-polarized radiation, the band gap always occurs between bands  $N$  and  $N + 1$ , where  $N$  is now the number of network cells in the structure.