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**A Perfect Electromagnetic Cavity: High Quality Factor in Subwavelength Dimensions**[1] VINCENT GINIS, Vrije Universiteit Brussel, PHILIPPE TASSIN, Ames Lab-U.S. DOE, Iowa State University and Vrije Universiteit Brussel, COSTAS M. SOUKOULIS, Ames Lab-U.S. DOE, Iowa State University and FORTH, University of Crete, IRINA VERETENNICOFF, Vrije Universiteit Brussel — Transformation optics has recently provided a new way to look at the interaction between light and matter. It uses the analogy between the macroscopic Maxwell's equations in complex dielectrics and the free-space Maxwell's equations on the background of an arbitrary metric to exploit the full potential of metamaterials, of which the most exciting examples are invisibility cloaks. In this contribution, we want to show how transformation optics can be applied to design a cavity with extraordinary properties. We have demonstrated theoretically the existence of eigenmodes whose wavelength is much larger than the characteristic dimensions of the cavity. Furthermore, our design avoids the bending losses observed in traditional microcavities, so that the quality factor is only limited by intrinsic absorption of the materials. Such a "perfect cavity" may be interesting for applications involving optical data storage or quantum optics, where it can be used to control the rate of spontaneous emission through the Purcell effect.

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