We present a method to design manufacturable extremal elastic materials. Extremal materials can possess interesting properties such as a negative Poisson's ratio. The effective properties of the obtained microstructures are shown to be close to the theoretical limit given by mathematical bounds, and the deviations are due to the imposed manufacturing constraints. The designs are generated using topology optimization. Due to high resolution and the imposed robustness requirement they are manufacturable without any need for post-processing. This has been validated by the manufacturing of an isotropic material with a Poisson's ratio of $\nu=-0.5$ and a bulk modulus of 0.2% times the solid base material's bulk modulus. © 2013 Elsevier Ltd. All rights reserved.