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Rijke tube with flexible walls SHREYAS MANDRE, BAO-NHAT NGUYEN, MARVIN LI, Brown University — Sound is excited spontaneously in a Rijke tube because the small temperature perturbations in an acoustic field interact with heat transfer from a heat source in the tube. The air particles near the heat source undergo a thermodynamic cyle converting heat to mechanical energy, which is heard as the sound emanating from the Rijke tube. This principle of energy conversion is used in thermoacoustic engines, and the main objective of this study is to improve their performance. The acoustic oscillations in the Rijke tube regulate the thermodynamic cycle, just as in conventional engines the cycle is controlled by the motion of a piston and the action of inlet and exit valves. The acoustic regulation in the Rijke tube, however, does not allow arbitrary control of the cycle in thermodynamic phase space. In this presentation, we introduce a new way of overcoming this limitation, one by using Rijke tubes with flexible walls. We will discuss how this modification allows for more general thermodynamic cycles to be executed by the air particles in the tube. This possibility, when used in thermoacoustic engines, opens a channel for further improving the engine performance.

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