

Active noise control in pipes and ducts using carbon nanotube thermophones

Abstract

Carbon nanotube thin films provide the capability to rapidly oscillate their surface temperature on time scales less than 10 nanoseconds. This unique feature allows them to be used as a thermophone, or thermoacoustic heat engine. As the surface of the film is rapidly and periodically heated by an electrical input signal, the surrounding air expands and contracts with the periodic heating to create a propagating acoustic wave. This type of loudspeaker is solid state with no moving parts and lightweight because there is no need for heavy magnets. In this paper, a coaxially configured thermophone will be discussed with applications in active noise control in pipes and ducts. Design parameters will be discussed as well as preliminary active noise cancellation data. Commercialization technical challenges will be presented.