

Magnetic excitation of ultrasound by thin films of concentrated paramagnetics

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Abstract

The recently discovered gigantic magnetostriction of certain rare earth compounds (about 10⁻³) is comparable with that of ferromagnetic materials. In addition, paramagnetic substances have a number of advantages. These include the higher values of saturation field, the absence of attenuation caused by the presence of domains, the possibility of controlling the excitation of ultrasonic waves (USWs) over a wide range of temperatures and constant magnetic field values by changing the magnetization. The authors have detected generation of plane USWs by a thin LiDyF₄ film applied on one of the plane parallel end faces of a diamagnetic LiYF₄ single crystal. The sample with the applied LiDyF₄ film was placed in a 'sine' induction coil so that the varying magnetic field of value about 30 Oe in pulse form was in the plane of the film and the constant magnetic field was perpendicular to this plane. The rf coil acted simultaneously for transmission and reception. The measurements were made at helium temperatures.
