TECHNOLOGY

Noninvasive Characterization of Mechanical Properties of Materials and Tissue using Magnetic Resonance Techniques

OVERVIEW

Many diseases alter the mechanical properties of tissue. Accordingly, the mechanical properties can serve as biomarkers for disease, diagnosis, and tumor assessment. While some larger diseased tissues or abnormalities near the surface of a patient can be detected by palpitation, many are located deep within the patient or too small to identify. Some indications include liver fibrosis or other growths inside the thoracic cavity. A non-invasive means for detecting mechanical properties of patient tissue would provide physicians with a reliable tool to diagnose and monitor diseased tissue.

Viscoelastic materials (complex fluids) exhibit the elastic properties of solids as well as the viscous flow characteristics of fluids in response ties of viscoelastic materials is known as 'rheology.' Rh asure the fluid flow response to deformational stresses.

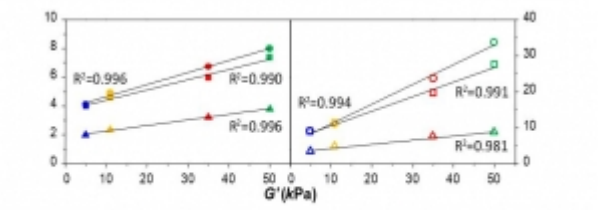

Figure 2: Dependence of NMR relaxation rates on mechanical properties of hydrogels¶

Magnetic Resonance Elastography (MRE) is one non-invasive method for detecting mechanical properties in a tissue in the field of Rheo-NMR. MRE mechanically excites the tissue by introducing shear waves through ultrasound. Nuclear Magnetic Resonance Images (MRI) of the propagation of the shear waves are taken. Specific mathematical algorithms are used to interpret the images and generate used to interpret the images and generate quantitative images depicting tissue stiffness.

ADVANTAGES

Non-invasive method for determining the mechanical property of a material or human tissue

STAGE OF DEVELOPMENT

The technique has been demonstrated in a number of model systems.

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Additional Information

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PATENT STATUS

US Patent 9,348,008

LICENSE STATUS

Available for License

CATEGORIES

- Devices
- Software + Algorithm
- Sensors/Monitors
- Industrial Processing
- Other

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ATTACHMENTS

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