FIELD-CYCLING NMR RELAXOMETRY MEASUREMENTS OF HYDROCOLLOIDAL SYSTEMS

Małgorzata Florek-Wojciechowska

Department of Physics & Biophysics

University of Warmia and Mazury

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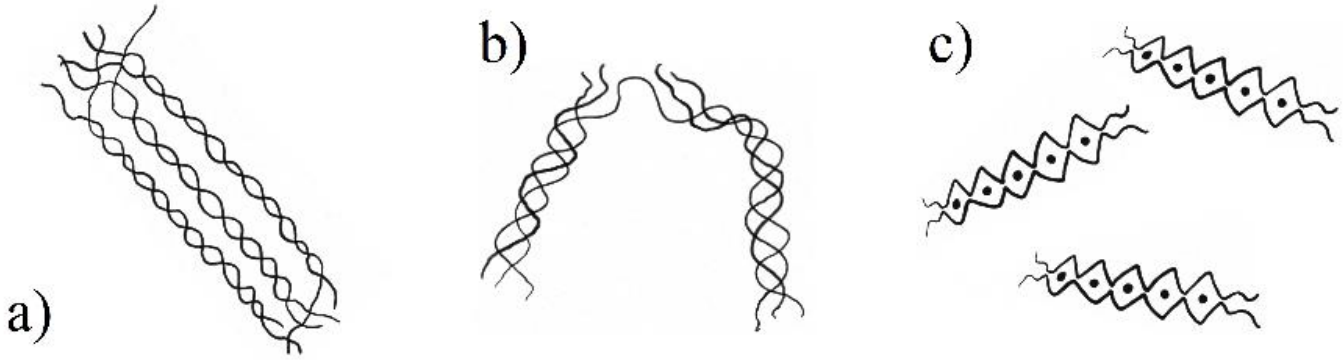
Hydrocolloids in food industry

- long chain polymers that can form viscous dispersions and/or gels when dispersed in water
- large number of hydroxyl groups => increased affinity for binding water
- used for thickening, gelling, emulsifying, stabilization, coating

- Pure plant extracts (starches, pectins, alginates, agar, carrageenan, cellulose)
- Seeds (Guar gum, Locust bean gum)
- Modified polysaccharides (modified starchesamidated pectinspropylene glycol alginate)
- Animal extracts (gelatin, cassein)
- Cellulose based (MCC, MC, EC, HPMC, CMC)
- Microbial / bacterial polysaccharides (xanthan, dextran, curdlan, gellan)
- Exudates (arabic gum, tragacanth)

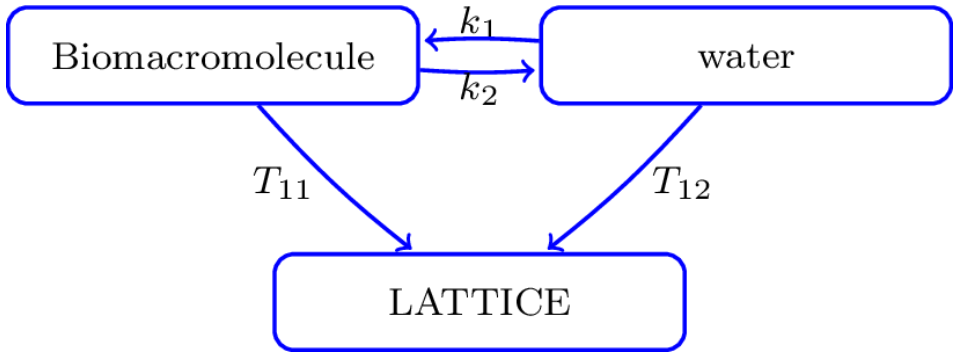
Mechanisms of gelation

- physical gels: partial crystallization of polymer chains / conformational coil-to-helix transition (thermally reversible)
- chemical gels: covalently cross-linked (replacing hydrogen bond by a stronger and stable covalent bonds) networks

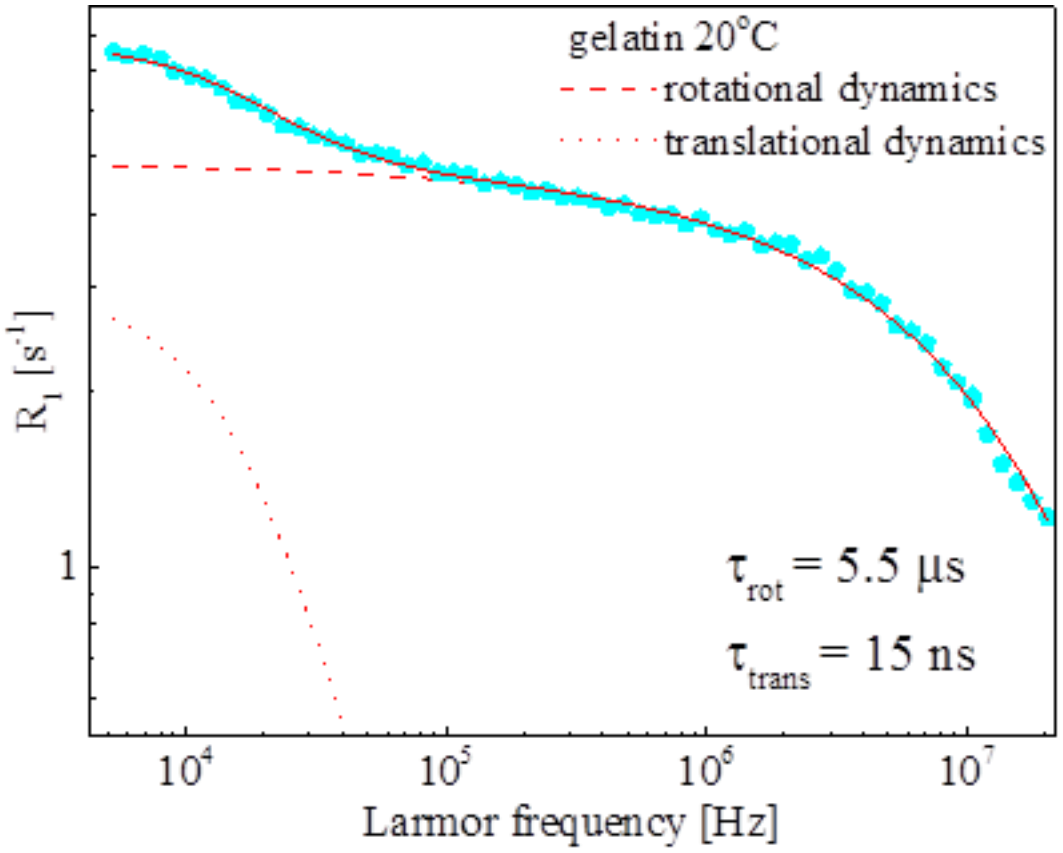


Relaxation in hydrocolloids

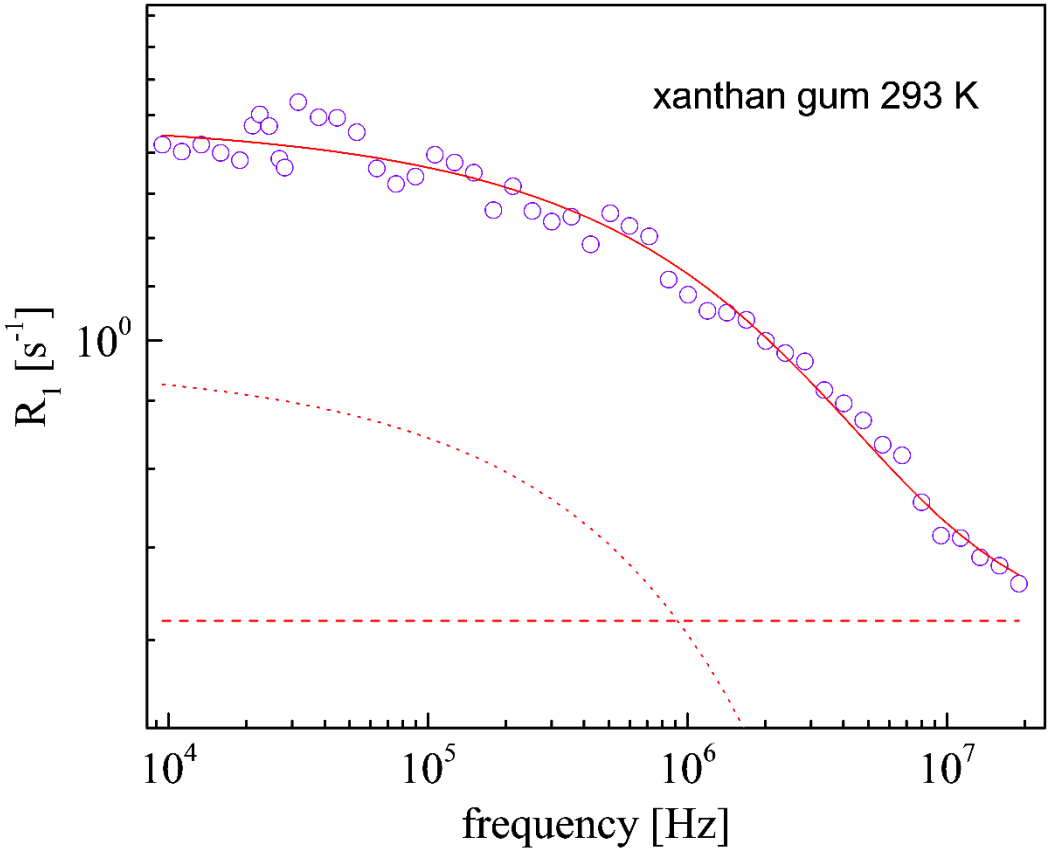
- Intramolecular + intermolecular terms:
- $R_{intra/inter} \propto J_{intra/inter}(\omega) + J_{intra/inter}(2\omega)$
- $J_{intra} = \frac{\tau_{rot}}{1+\omega^2\tau_{rot}^2}$
- $J_{inter} = \int_0^\infty \frac{u^2}{81+9u^2-2u^4+u^6} \frac{u^2\,\tau_{trans}}{u^4+(\omega\tau_{trans})^2}\,du$
- Magnetization transfer effects!



Pork gelatin

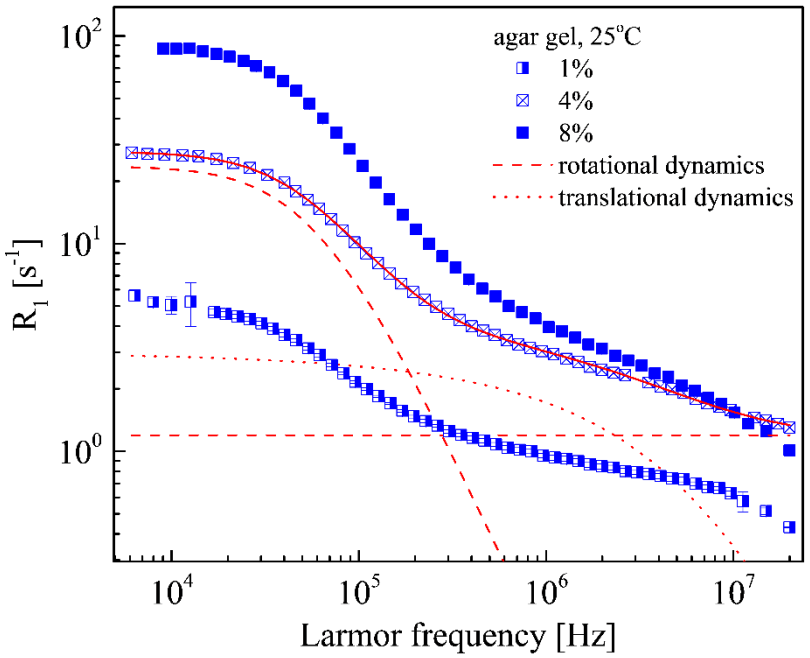


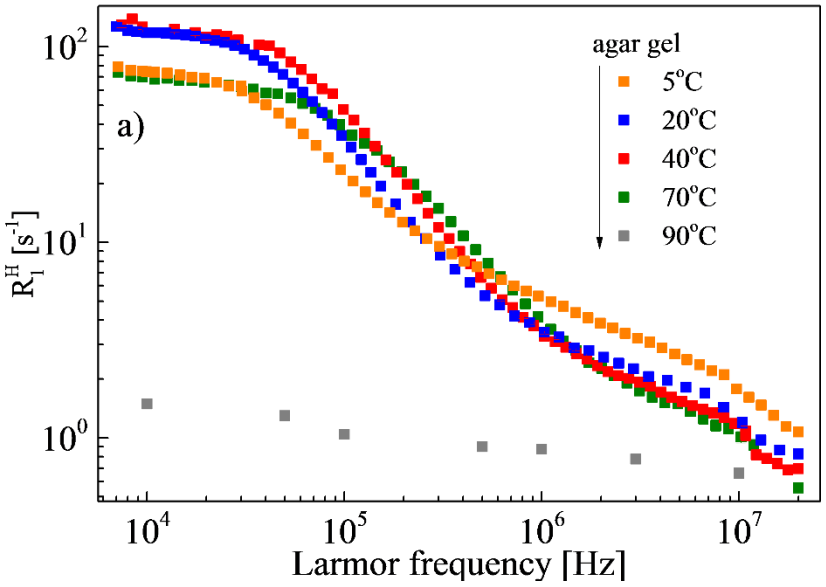
Xanthan gum

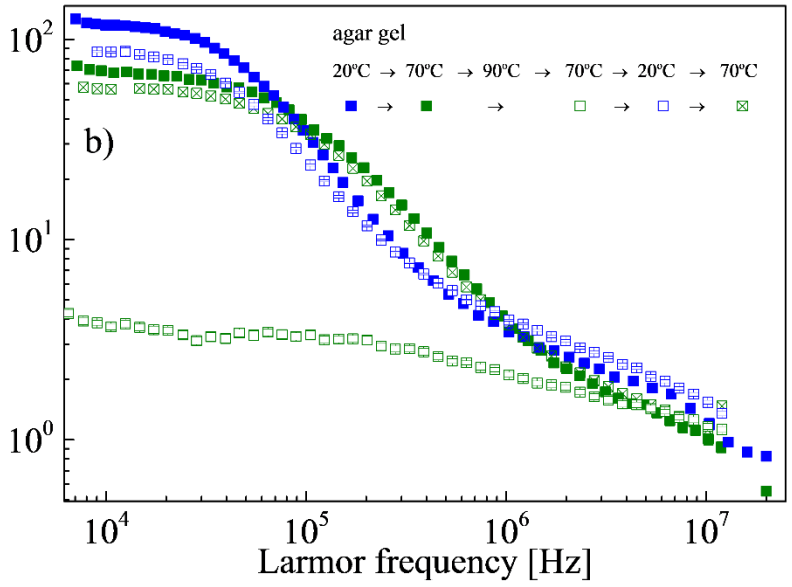


Agar-agar

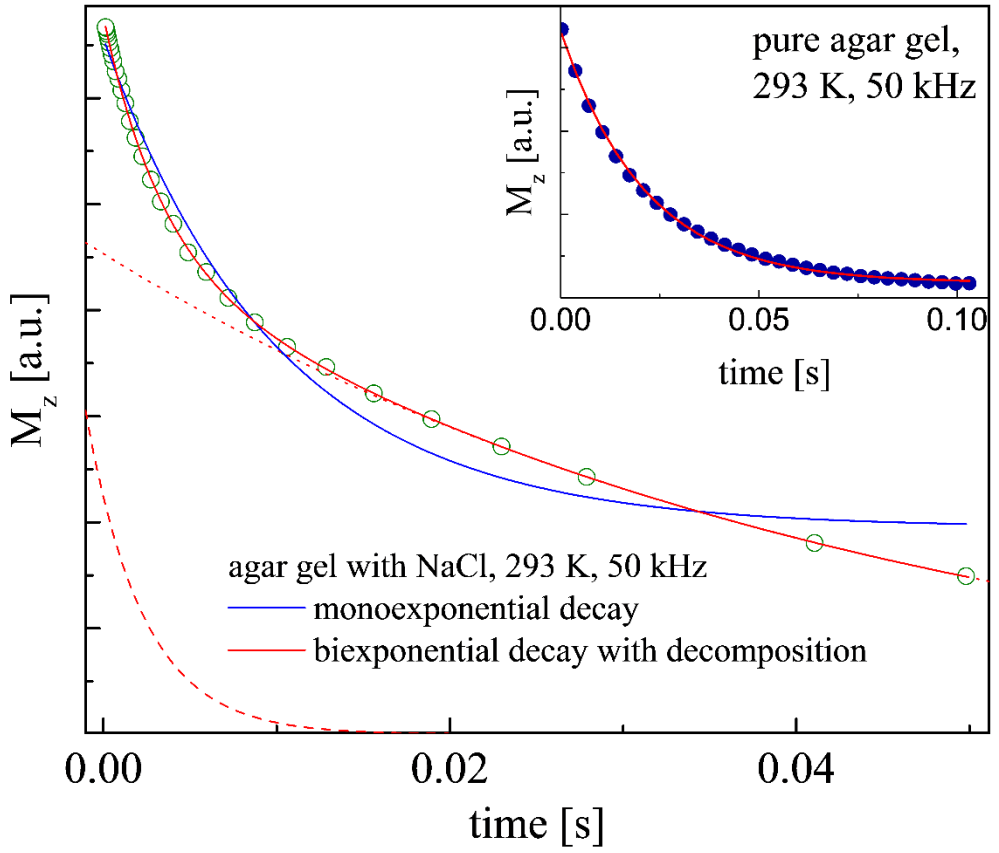
- source: red seaweeds (Rhodophycae)
- thermally reversible but
- gelling hysteresis effect
- used as a tissue model for MRI

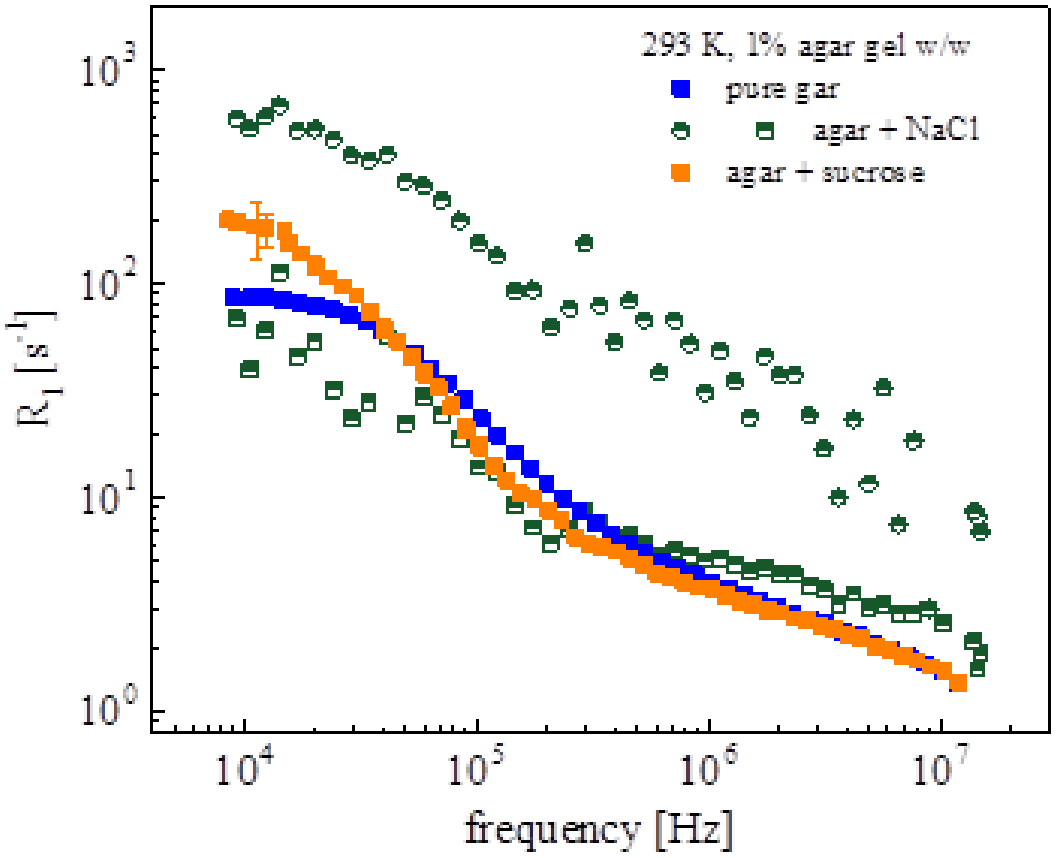






Influence of additives on polysaccharide gel dynamics





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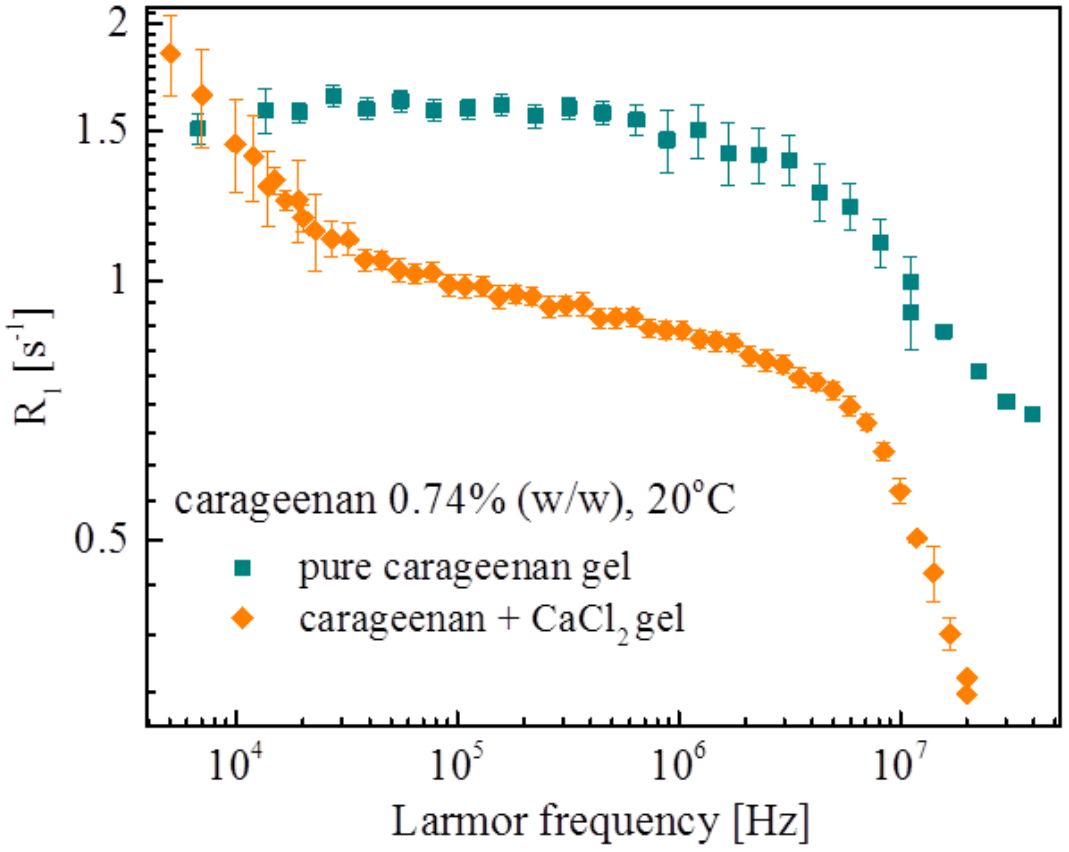

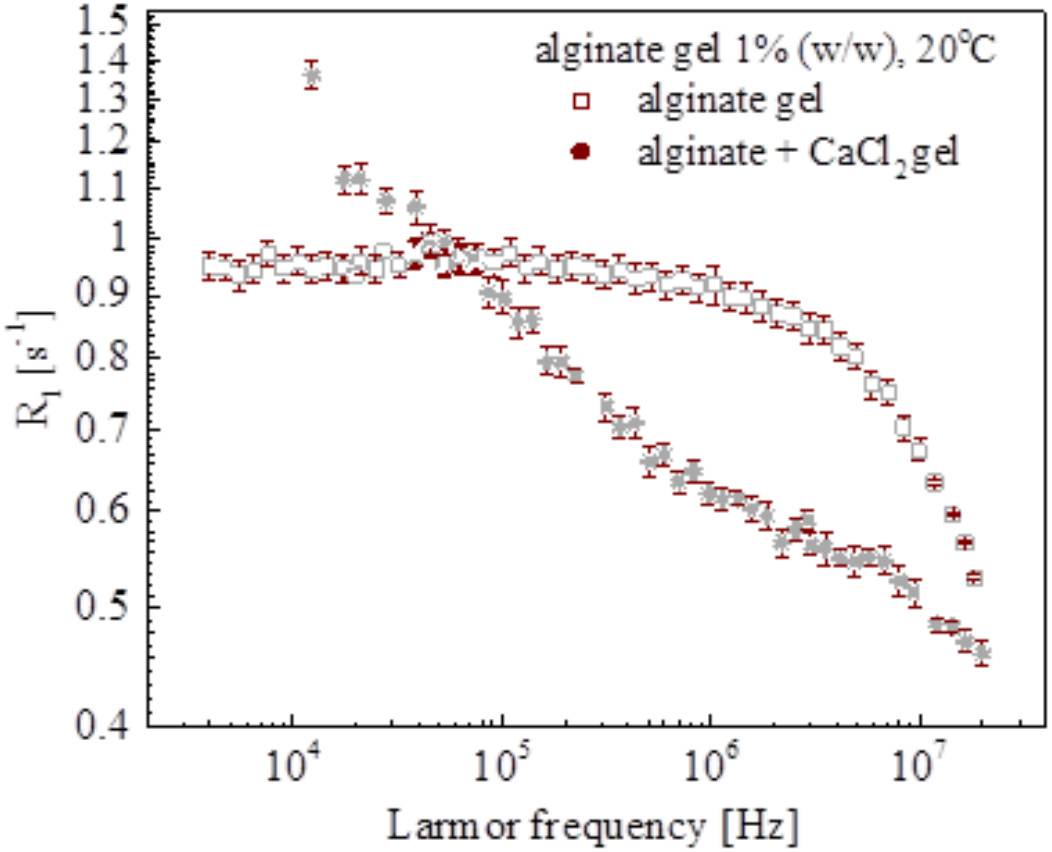

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