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Disposable Planar Microwave Sensor for Real-time Monitoring of Lubricant Depletion on Lubricant-infused Coated Medical Implants

Disposable Planar Microwave Sensor for Real-time Monitoring of Lubricant Depletion on Lubricant-infused Coated Medical Implants

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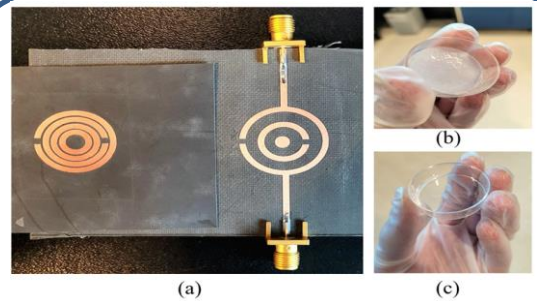
STATUS QUO

LIS evaporation real- time Monitoring

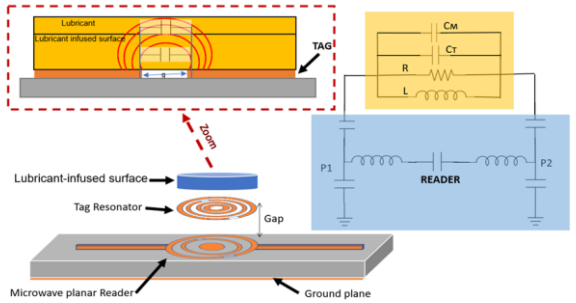
- ✓ A novel method for real-time monitoring Lubricant Depletion on Lubricant-infused Coated Medical Implants.
- ✓ LIS prevent clot formation and bacteria adhesion on medical implants.
- ✓ Various approaches have been used ,including volume and contact angle measurements and microscopic techniques that are not capable to real-time monitoring.

NEW INSIGHTS



- ➢ A tag SRR as the main sensing interface coupled to a planar reader to monitor lubricant evaporation on LIS.
- ➢ The bacterial nanocellulose membrane, which is porous in structure, can retain lubricant for a longer period compared to other surfaces due to its unique nanostructure.

DESCRIPTION



✓ Microwave sensing setup mainly composed of:

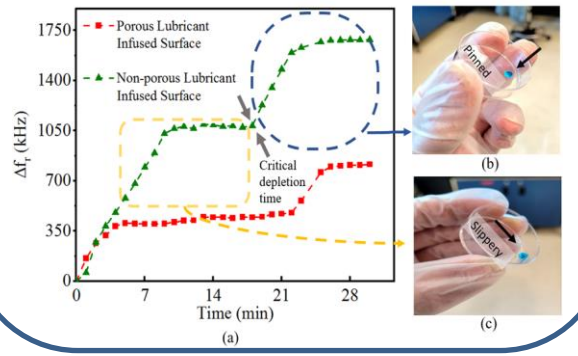
- ➢ The tag resonator is coupled to a microwave planar reader with a full ground plane on the bottom.
- ➢ The tag is integrated with a container that is a lubricant-infused surface.
- ➢ The tag wirelessly communicates the lubricant evaporation trend to the reader.

✓ The features

- ➢ The design can be used as a disposable monitoring device for surface monitoring applications.
- ➢ The setup works based on frequency variation.
- ➢ The porous LIS proposed which are able to contain more lubricant

QUANTITATIVE IMPACT

- ➢ absolute value of resonance frequency shift during the time is depicted.
- ➢ The time to depletion was longer for the hydrogel substrate due to the porous nature giving rise to capillary forces holding the lubricant within the pores.
- ➢ During the microwave sensing measurement, a water droplet sliding test was performed as a secondary test to verify the presence of the lubricant layer.



PROPOSED CONCEPT GOALS

Novel disposable microwave noncontact sensing :

- ✓ Determines depletion trend, critical lubricant thickness and critical depletion time, which is LIS-specific
- ✓ Highly sensitive towards different evaporation trends and independent of surface type