

WINGS (Wireless Ice Nucleation Gas Sensor), a Tool for Characterization of Ice Nucleation During Lyophilization

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Categories:

- Pharmaceuticals

Keywords:

- Controlled Ice Nucleation
- Lyophilization
- Pharmaceuticals
- Wireless sensor

Researchers at Purdue University have developed wireless sensors for characterizing ice nucleation during lyophilization. Which is a freeze-drying method extensively used by pharmaceutical manufacturing companies. While ice nucleation is required for freezing and is, thus, fundamental to lyophilization, the process conditions associated with it are poorly understood. Controlling this process is associated with a reduction in primary drying time and better product quality. The Purdue sensors determine gas pressure and temperature in the lyophilization chamber and vial headspace during the adiabatic depressurization step associated with ice nucleation. Using this data, ideal freezing input conditions such as chamber pressure, shelf temperature, vial size, and vial fill volume for any desired lyophilized product can be determined, and a design space can be generated. The devices provide data in real-time, which is recorded automatically.

Technology Validation: The researchers used the sensors to characterize gas pressure and temperature for both the vial headspace and the chamber during ice nucleation for loaded and empty chambers and different vial types. The work showed the ice nucleation process can be modeled as an adiabatic isentropic process.

Advantages:

- Real-time access to data
- Non-invasive measurement of vial headspace conditions
- Lower primary drying time
- Better product quality

Applications:

- Characterizing ice nucleation in lyophilization

People:

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Intellectual Property:

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