

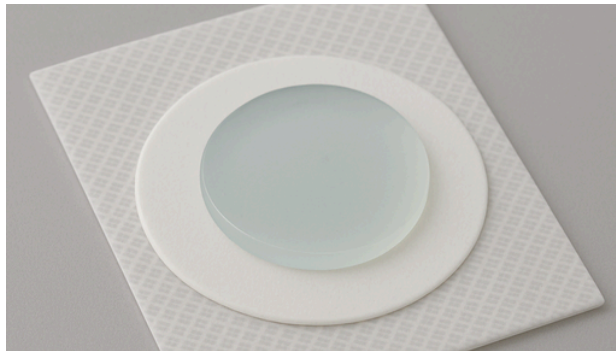
# WHITEPAPER

## Hydrogel: Dry vs. Wet

### Hydrogel Technology in Custom Medical Electrodes

Today's medical electrodes rely heavily on hydrogels to maintain skin contact, ensure signal quality, and provide the optimal patient comfort. As the demand for wearable and long-term monitoring devices continues to grow, choosing between dry and wet hydrogel technologies has become a vital and pressing decision for OEMs and device designers.

Whether you're developing ECG patches, EMG sensors, or remote health monitoring wearables, understanding the strengths and trade-offs of each hydrogel type will help optimize your device design.



DRY HYDROGEL



WET HYDROGEL

### Why Does Hydrogel Choice Matter?

Hydrogels are polymer networks that hold water and conductive agents. This makes them an ideal choice for skin-contact electrodes. They serve two essential roles:

1. Conductivity - enabling the body-to-device transfer of signals like ECG, EEG, or EMG.
2. Adhesion - maintaining skin contact without irritating the end user.

In today's medical landscape, where form factor, reliability, and patient comfort are driving factors, OEMs must weigh performance vs. longevity, cost vs. compliance, and user experience vs. manufacturability when selecting a hydrogel type.

## WHAT'S THE DIFFERENCE?

### DRY HYDROGEL

- Minimal free water; activated by skin moisture or pressure
- Better suited for long-wear and portable monitoring devices

### WET HYDROGEL

- Contains high moisture content (typically > 60% water), leading to a more free-flowing gel
- Delivers excellent conductivity and low impedance at the skin interface

Dry hydrogel is the most commonly utilized material among OEMs due to its proven reliability in biosensing and stimulation applications. However, wet hydrogels exhibit distinct physicochemical properties, such as higher water content and enhanced conformability, that make them more suitable for niche scenarios where dry formulations are inadequate or incompatible.

## DRY HYDROGEL

### Key Advantages

- Extended shelf life
- Consistent adhesion
- Self-supporting structure

### Common Applications

- Remote patient monitoring
- Holter Monitoring
- Fitness and biometric wearables
- Neonatal monitoring

### Limitations

- Slightly higher impedance
- Longer period to stabilize the signal

## WET HYDROGEL

### Key Advantages

- Low skin-electrode impedance
- Soft and flexible

### Common Applications

- Clinical ECG leads
- EMG diagnostics
- EEG monitoring
- Emergency and ICU monitoring

### Limitations

- Susceptible to dry out
- Requires the use of a scrim material to maintain shape and location
- Shorter shelf life (typically 6-12 months)

## MANUFACTURING CONSIDERATIONS FOR OEMS

### Processing & Converting

Dry hydrogels offer greater structural stability, allowing for die-cutting, lamination, and ease of packaging. Wet hydrogels are fluid, often requiring dispensing equipment and a scaffold layer to retain position.

### Packaging

Dry gels are more forgiving, reducing logistics complexity and cost. Wet gels are more susceptible to moisture and require sealed, low-humidity environments.

## CONCLUSION

When selecting between wet and dry hydrogel technologies, OEMs must consider wear time, manufacturing feasibility, and end-user experience.

In Summary:

- Choose dry hydrogel for long-term wearables, where shelf life, adhesion, and user comfort are top priorities.
- Use wet hydrogel for high-performance, short-term applications where immediate signal quality is critical.

When partnering with SSI Medical, an experienced electrode manufacturer, we help you navigate these decisions efficiently and with application-based solutions.

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## SSI MEDICAL

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At SSI Medical, we specialize in the manufacturing of custom, advanced hydrogel-based medical electrodes for OEMs around the world. With in-house R&D, ISO 13485-certified production, and a full suite of customization capabilities, we aim to deliver solutions that meet the evolving needs of clinical, wearable, and at-home applications.

- Scalable manufacturing
- Regulatory support (ISO 10993, EC-12 Testing)
- Rapid prototyping for OEMs

GET IN  
TOUCH!

Ready to explore the best hydrogel solution for your application?  
Let our team guide you with experience-driven insights, samples, and  
manufacturing expertise.