



Game-Changing Materials to Control Modified Atmospheric Packaging

With nearly 50% of the world's fruit and veg going to waste, according to the [FAO](#), there's still a huge opportunity for active and modified atmospheric packaging to help **keep food fresher for longer**. However, amidst the ever-mounting pressure to provide more **environmentally friendly packaging** and **keep costs down**, the industry faces quite the balancing act. **MOFs** (metal-organic frameworks) could be the innovation the industry needs to **address all of these aspects**.

Benefits of MOF-Powered Produce Packaging

Non-toxic and inexpensive, MOFs are creating value within the Modified Atmospheric Packaging industry by:

- Extending shelf-life of fresh fruit and vegetables
- Maintaining taste and quality
- Providing sustainability opportunities
- Standardizing packaging

But What Are MOFs?

MOFs are a new class of highly porous materials (up to 10,000 m²/g) with unique functionalised pores and an unrivalled affinity to capture, store, and release gases like CO₂.

“ MOFs have the highest known capacity for CO₂ and their highly functionalised pores enable the selective capture and release of the gas via physisorption. Other sorbents cannot hold anywhere near as much gas and are unable to be used in such a selective manner - a critical feature required to maintain optimal MAP conditions and extend shelf-life ”

Dr. Jose Casaban, CTO at MOF Technologies.

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Combined with this unparalleled affinity to control CO₂, these affordable, non-toxic materials (previously approved for use by the [FDA](#)) can be shaped to suit a variety of MAP products e.g. sachets, stickers, pads etc. This combined with our environmentally conscious extrusion manufacturing process makes them an ideal solution for the next generation of Modified Atmosphere Packaging products.



Extending Shelf-Life

Whilst many MAP solutions focus on controlling humidity, regulating carbon dioxide concentrations in the headspace of packaged fruit and veg is also a critical lever to extending shelf life. That's why we have developed a dynamic MOF (metal-organic framework) based buffer, which both scavenges and emits CO₂, maintaining optimal carbon dioxide levels for longer.

We've shown that our MOF-based solution can regulate the CO₂ levels within fresh-cut mango packaging, extending shelf life by up to 1 week. What's more, all of this could be realised for just a few pennies per pack and could also enable the use of more sustainable packaging materials as well as provide opportunities for cost-savings through the use of more standardized packaging.

Providing New Opportunities for Sustainable Packaging & Standardizing MAP Designs

Several MAP products seek to control the dynamic atmosphere by exploiting the packaging's permeability using polymer type, thickness, and micro-perforations to control gas exchange rate. Others, use chemical absorbents that react with and permanently remove the CO₂.

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However, as different fruits and veg require distinct CO₂ storage concentrations and respire at varying rates across their lifecycle, achieving an optimal equilibrium modified atmosphere can be a complex challenge. This task is further complicated by the influence of packaging type, pack volume, fill weight, storage temperature, and light exposure, which can vary throughout the supply chain.

Things start to become even more challenging when addressing cut fruit and veg, whereby the respiration rates can be up to an order of a magnitude greater than their whole fruit equivalent. Consequently, bespoke packaging solutions are required on a case-by-case basis which can increase manufacturing complexity and even limit recyclability.

Our dynamic MOF (metal-organic framework) based buffer, which both scavenges and emits CO₂, can do just this, maintaining optimal carbon dioxide levels for longer. This opens the door for new, environmentally friendly packaging options as well as standardization of packaging lines for different types of fruit and veg, as CO₂ levels are controlled regardless of respiration rate.

In Conclusion

With increasing consumer pressure, extending shelf-life of fresh produce and adopting more sustainable packaging has never been more pressing. Non-toxic and economical, a dynamic metal-organic framework (or MOF) CO₂ buffer system is just what the MAP industry needs, extending the shelf-life of fresh fruit and veg and providing new opportunities for standardized, environmentally friendly packaging, without compromising on taste or quality.

Let's Innovate Together

Are you interested in a more sustainable packaging solution that mitigates the risk of fluctuating gas storage atmospheres and extends the shelf-life of fruit and veg without compromising on quality? We're looking for development partners to further develop and deploy this innovative tech.

If your organisation could be the development partners that we are looking for, or to find out more, email us at contact@moftechnologies.com

MOF Technologies allow you to unlock the game-changing power of MOFs for new product development. We take innovative organisations from ideation to commercialisation in a low risk, cost-effective and scalable way, using our unrivalled MOF-expertise, patented technology and tried and tested co-development process.



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