Dendritic Identifiers

Connecting Items in the Agri-food Supply Chain to their Digital Presence in the Cloud

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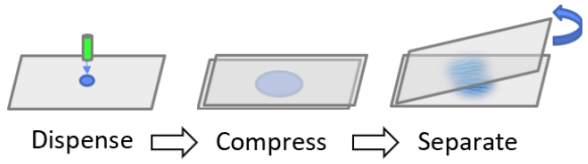
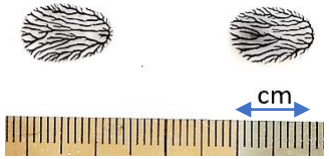
Contamination, counterfeiting and waste thrive in an information-poor environment

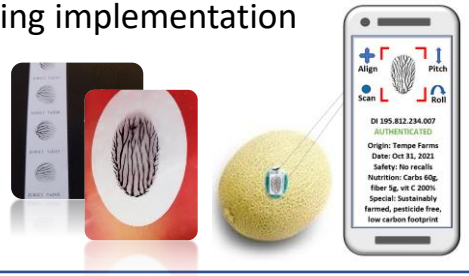
- Secure information management via DLT/blockchain (e.g., IBM Food Trust) is being deployed in agri-food chains in an effort to increase transparency
- This requires a universal **digital trigger** – a unique and secure physical identifier placed on goods or packaging to form a strong link between each item and its digital presence/*digital identity* in the cloud

Our connection to the Cloud uses *dendrites* formed via natural processes in an inexpensive material system

- Dendrites are extremely **simple to make** using processes that are similar to printing or stamping
- They have an underlying structure that is predictable but **no two are exactly the same**, much like **fingerprints**, so each item in the supply chain can have its own unique and robust identifier
- The patterns can be read and verified using a **cell phone**, streamlining implementation

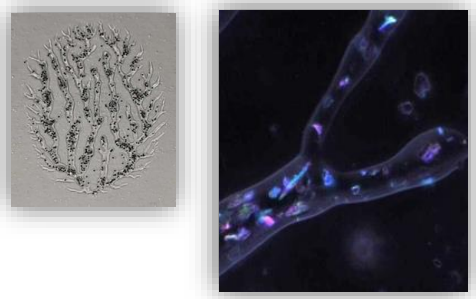


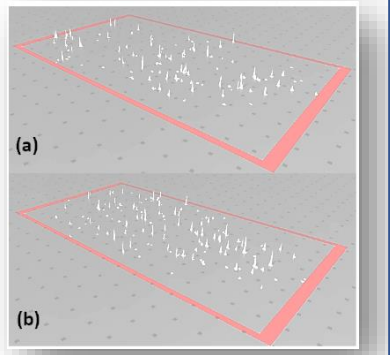




Physical security to match the blockchain

- **Digital identity** arises from the unique shape of the pattern, **authentication** comes from its **composition**





- Microscale reflectors create an **optical signature** that changes with viewing angle
- Identifiers are **unclonable**

Optical signature
(a) 30° left view
(b) 30° right view

Benefits of dendritic patterns

1. Mathematically demonstrable uniqueness **2**. Rule-based formation promotes error correction **3**. Patterns are easily read using computer vision techniques. **4**. Made by nature!

Fresh Produce RESEARCH CENTER

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