Disintegration Screening for Non-Compostable Inks and Coatings

Introduction

Disintegration screening is a crucial step in assessing how non-compostable materials, such as inks and coatings, impact the physical breakdown of certified compostable biodegradable substrates. These substrates may include films, papers, or laminates designed for compostability. Screening is especially important for materials that are not food sources for microorganisms but are used within allowable limits under industry standards and third-party certification schemes.

Field Testing Considerations

Field testing serves as an effective and low-cost initial screening method for disintegration. However, it is subject to natural environmental variables such as:

- Moisture levels
- Pile temperature
- Airflow
- Time
- Compost composition

A failure in a single specimen should not be interpreted as a definitive pass/fail result. Instead, it provides a clue for further investigation. When multiple samples with known differences (e.g., UV versus EB) are tested, patterns can emerge that indicate which formulations perform more favorably. However, failure of one material does not necessarily mean it will never pass.

Developing Sustainable Coatings and Inks

Ideally, the industry should focus on developing UV and EB systems from natural materials that can be wholly or partially assimilated, rather than relying on synthetic alternatives that may negatively impact the end-of-life (EOL) outcome.

Observations on EB and UV Systems

- **Electron Beam (EB) Systems:**
    - EB coatings and inks consistently pass disintegration screening.
    - Past studies, such as one conducted by PCT (Sage) for RadTech, support this observation.
- **Ultraviolet (UV) Systems:**
    - UV systems require further research to understand their impact on biodegradation.
    - The formulation type (100% solids, water-based, or solvent-based) is less significant than the polymer and material composition.
    - No current test other than disintegration screening effectively determines how a particular UV coating or ink affects the compostability process.

Ideal Substrates for Testing

To conduct meaningful disintegration screening, the ideal substrates should be:

1. **Biopolymer Film-Based Substrates**
    - PLA (Polylactic Acid) is a preferred material due to its established compostability.
2. **Certified Compostable Paper Substrates**
    - Paper certification is not always straightforward.
    - Papers containing latex binders often fail disintegration tests due to microbial inaccessibility.
    - Many paper suppliers avoid certification testing, anticipating that additional downstream testing will be required once applications are developed.

Recommended Next Steps

Given the consistent success of EB systems and the knowledge gaps in UV systems, a comprehensive study of UV chemistries for inks and overprint varnishes (OPVs) is recommended. This study should be conducted in a controlled laboratory setting to eliminate the variability present in field testing. Potential research partners include:

- **University of Georgia's New Materials Institute**
- **Aropha (a new testing lab in Ohio)**

Conclusion

- **EB systems perform as expected and consistently pass disintegration screening.**
- **UV systems require further study to evaluate their impact on biodegradation.**
- **A structured laboratory study should be conducted to assess all primary UV formulations, including inks, OPVs, and other relevant categories.**

By refining our understanding of UV systems and their impact on compostability, the industry can move toward more sustainable packaging solutions that align with compostability standards and circular economy goals.