Advanced Techniques for Integrating Brand-Authenticating DNA into Point-of-Sale Packaging Materials

Presented by:

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Discussion Agenda

- Landscape of Counterfeit Point-of-Sale Packaging
- Legitimate vs. Illegitimate Supply Chains
- Description/Application of Equipment and Processes
- Experimental Design & Results
- Discussion/Conclusions

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- Global supply chain complex, highly interconnected.
- Difficult to determine source of a finished product.
- Difficult to verify product safety, ethical production, environmentally friendly.
- Consumer trust.
- Inherent trust that retail merchants ensure products are genuine.

Examples of how counterfeits directly threaten health, safety and lives of the consuming public:

- According to the World Health Organization and INTERPOL, 50% of medications for malaria and 10 percent for tuberculosis are fake - possible to kill approximately 700,000 persons per year.
- According to Oceana, one-third of all fish samples collected from 674 retail outlets in 21 states were mislabeled.
  - 59% of 46 fish species tested were mislabeled.
  - Fish with high mercury content were sold to customers who had ordered safer fish.

- Long term impacts from counterfeits are multi-faceted.

Negative effects

1) Lost sales
2) Lost brand value
3) Consumers, health and safety risks
4) Low quality goods lead to higher cost for replacement
5) Lost tax and customs revenue
6) Increased enforcement cost
7) Risks to national security supply chains

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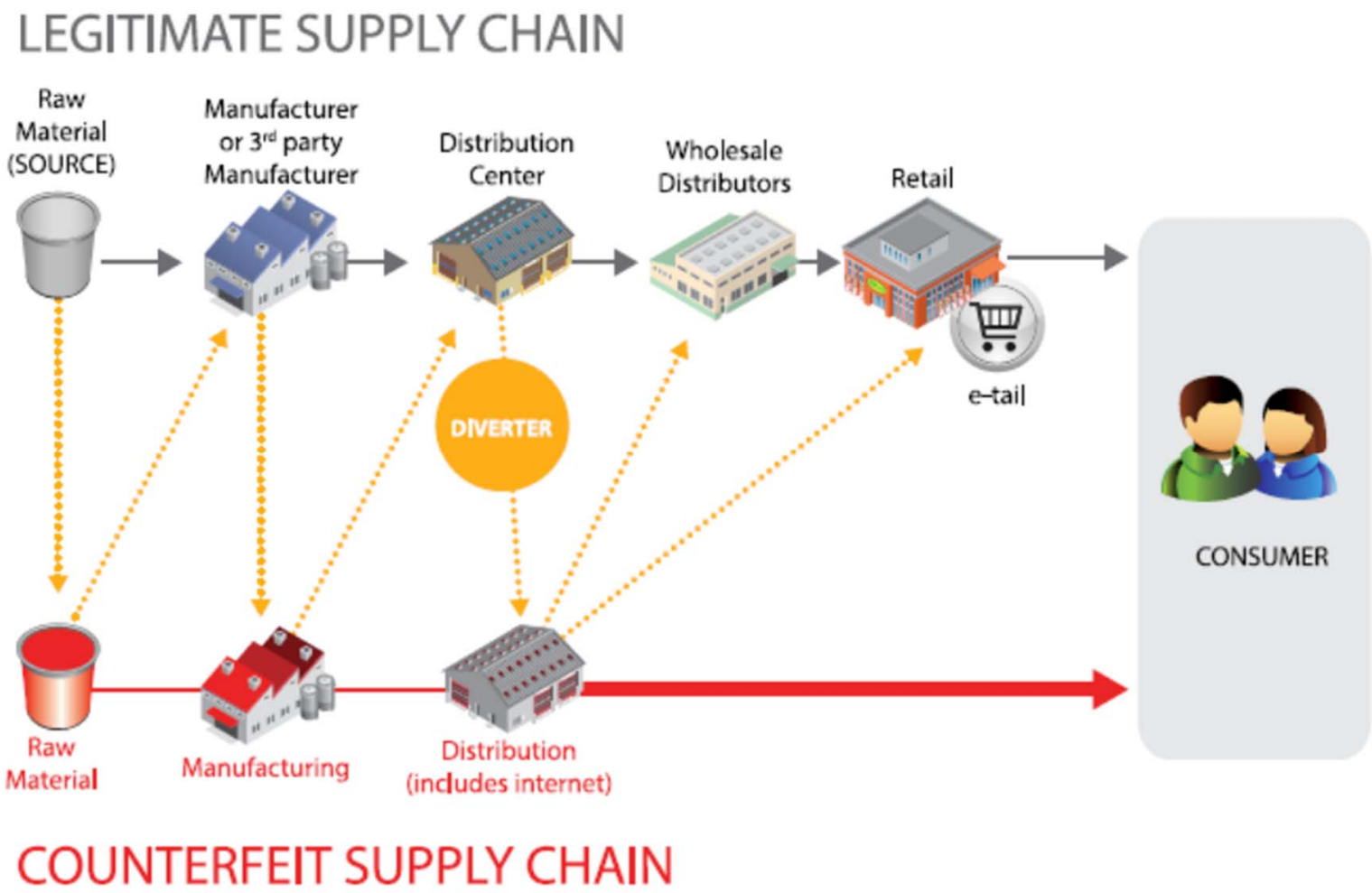

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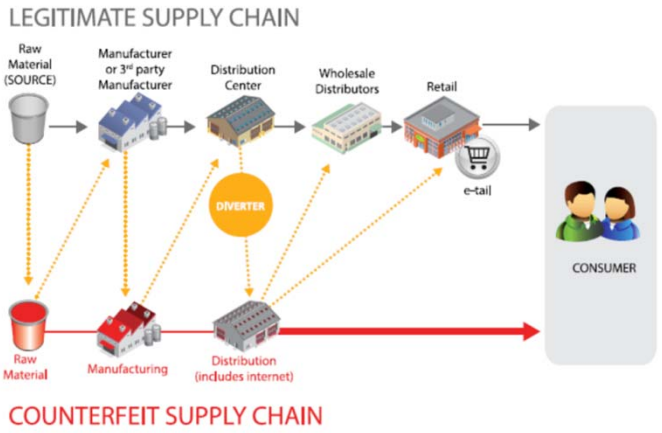
Reality 1 - Leakage and counterfeit entry can happen at nearly any point.

Reality 2 – Both supply chains can be independent.

Reality 3 - Aspects of legitimate supply chain can bleed into the counterfeit supply chain.

Reality 4 - Counterfeits can be introduced in the delivery of authentic product.

➡ All paths lead to the consumer.



Solution required:

- Verifiable authentication at each stage of the supply chain
- Real-time transparency of chain of custody transfer
- Court-defendable evidence for internal and external investigations
- Measurable benefits

- Provenance data required.

- Theorized that “patented DNA” applied with use of atmospheric plasma surface treatment could provide a “product marker” which could survive the supply chain.

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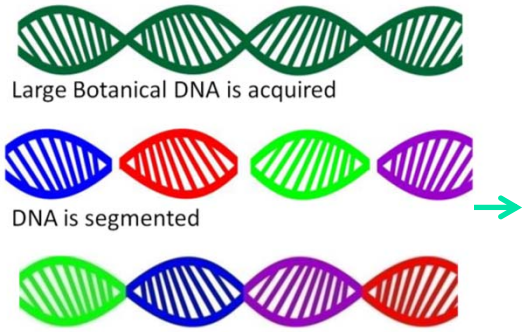
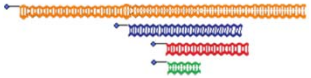
DNA Marker Platform

Original Plant Source(s)





DNA Formulation

DNA Concentrate in ink or other host carrier

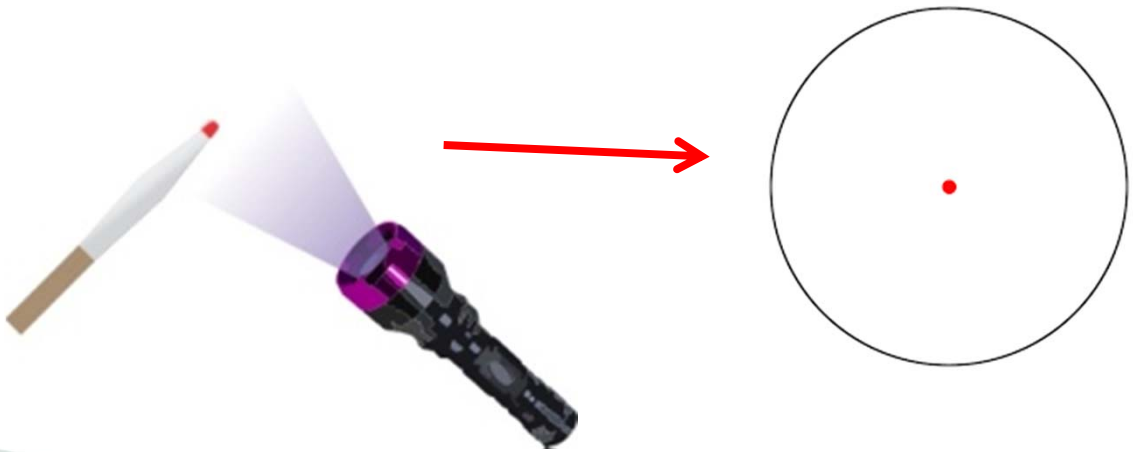
Platform tested and verified to be highly resistant to UV radiation, heat, cold, vibration, and other extreme environmental conditions across a broad spectrum of materials.

Key DNA Marker Benefits

- Cannot be copied
- Flexibility - can be customized with unique identifier/s
- Protects the integrity of the product, and brand from point of origin to finished product.
- Does not impact on the product performance
- Can help to assure quality and performance
- Can be utilized at any point in the manufacturing process
- Scalable
- Economical

In-Field Marker Screening

- Marker chemistry remains invisible both under ambient and UV light.
- "Swab activation" of chemistry will make marker appear "red" under UV light.



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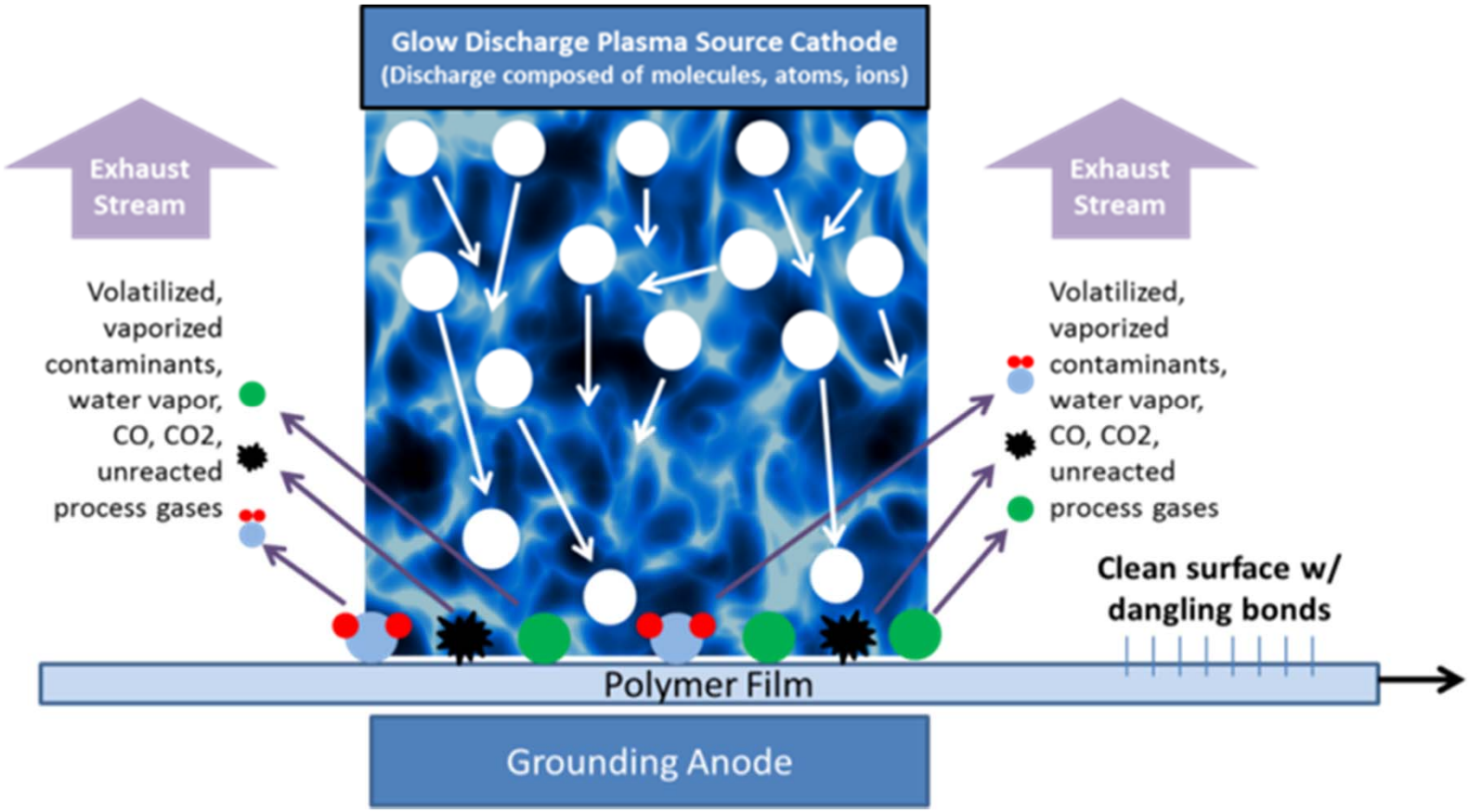

Atmospheric pressure plasma activation technology consisted of treatment station, process gasses, electronic gas controls, and power supply.

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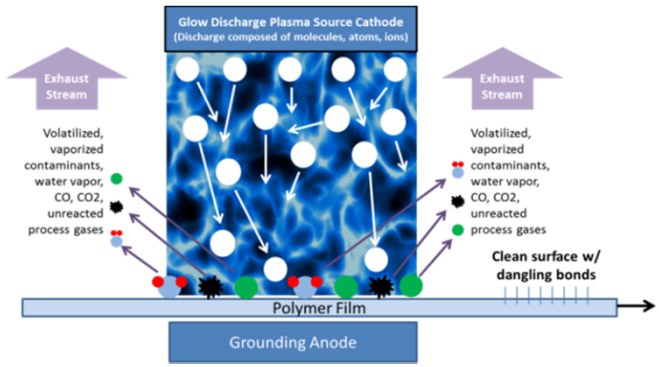
- Proprietary DNA marker molecules provided by Applied DNA Sciences.
- ITW Pillar Technologies provided dilution atmospheric plasma CVD technology.
- DNA marker molecules reacted within plasma discharge above polyethylene film which was conveyed at 200 feet per minute at a prescribed watt density.
- N2 and O2 plasma gases excited under RF power at a defined frequency.



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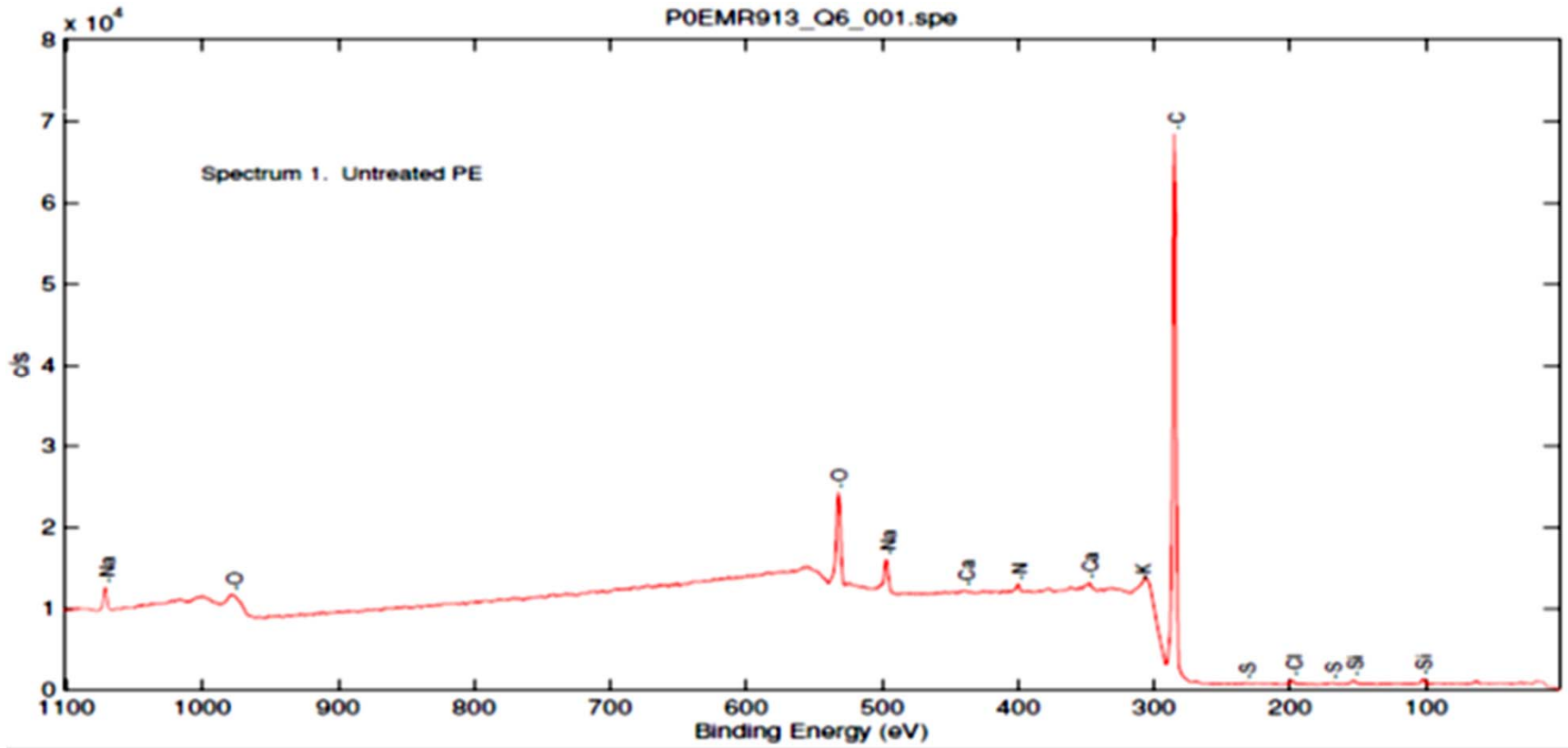

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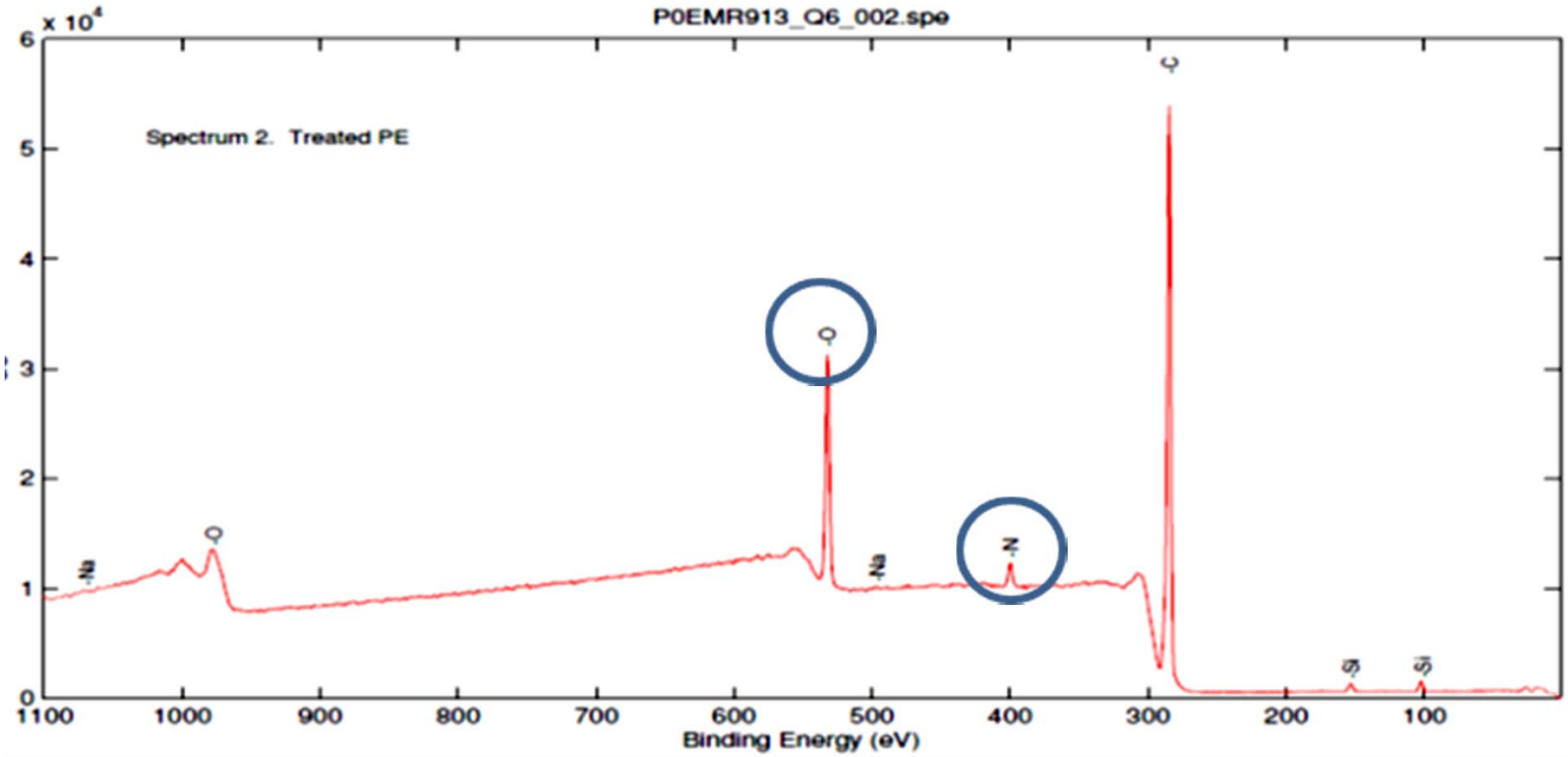

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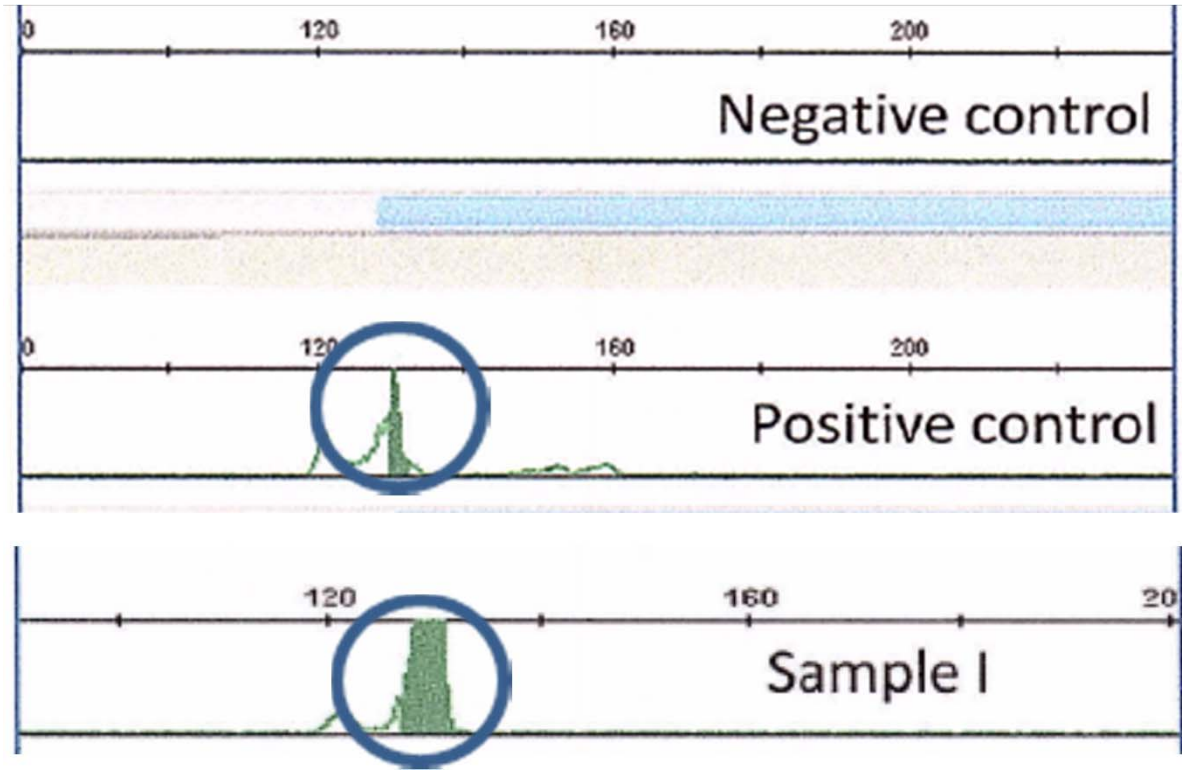
Electropherogram of a DNA marker



Key Findings/Confirmations:

- Post-plasma surface:
  - increase in nitrogen and oxygen content.
  - reduction in surface sodium, sulfur, chlorine, potassium, and calcium.

- Positive DNA peak confirming the deposition and presence of a DNA marker on film.

Discussion/Conclusions

- DNA marker grafting to polyethylene film at commercial speed by RF atmospheric pressure plasma treatment process established.
- PE film confirmed by XPS analysis to be modifiable in a way in which was chemically consistent with the process gas chemistries applied.

Discussion/Conclusions

- Electropherogram confirmed presence DNA marker following plasma reaction and grafting.
- DNA-based anti-counterfeiting markers can be affixed to point-of-sale packaging materials with commercial atmospheric plasma technology.
- Authenticity of branded product packaging can be achieved.

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PLACE

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Thank you for attending:

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