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Functional Filter Wrapping Materials and their Impacts on Specific Properties of Factory Made Cigarettes and Heated Tobacco Products

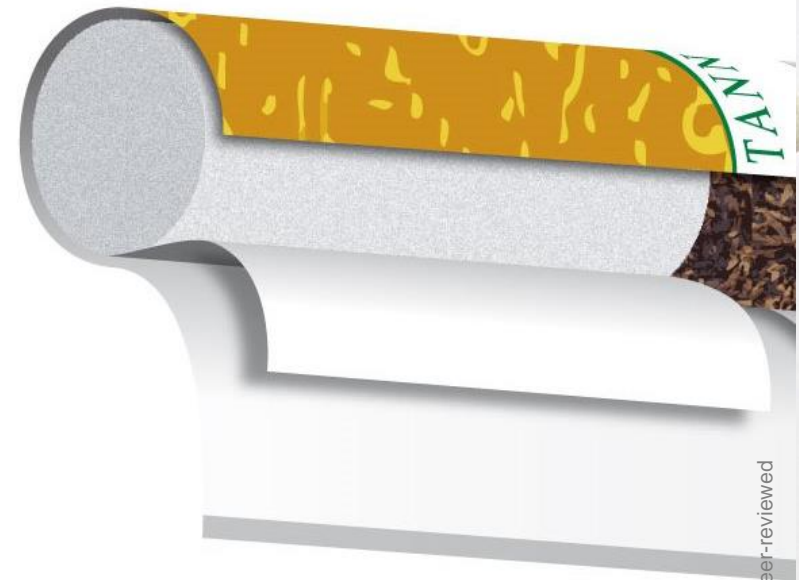
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INTRODUCTION

- TANNPAPIER terminologies:
 - Heated Tobacco Products (HTP) = Tobacco Heating Products (THP) = Heat-not-Burn Products (HnB) = “Heat Sticks”
 - In the following, “HTP” will be used
- From an outer perspective, HTPs look like factory made cigarettes (FMC; KS, short KS, SS, etc.)
- FMCs and HTPs require filter wrapping materials:
 - Thin and flexible sheets made of paper or alternative web substrates
 - For a reliable product quality and specific technical properties
 - Filter wrapping materials = Tipping Paper + filter plug wrap paper



FEATURES OF TIPPING PAPER

- Connection of the tobacco rod with the filter plug
- Perforation for specific filter ventilation and smoke yields
- Brand characterization via printing, hotfoil stamping, etc.
- Carrier for special substances (e. g. aromas)
- The only part of the FMC / HTP which is in direct contact with the human lips of smokers
- The first item the consumer sees and touches after opening the FMC / HTP pack
- Addresses directly the human senses of tactile or haptic perceptions on the lips and fingers
- Essential communication tool between the FMC / HTP and the consumer through various surface features



TACTILE INTERACTION WITH THE CONSUMER: SUPER LIP-RELEASE TIPPING

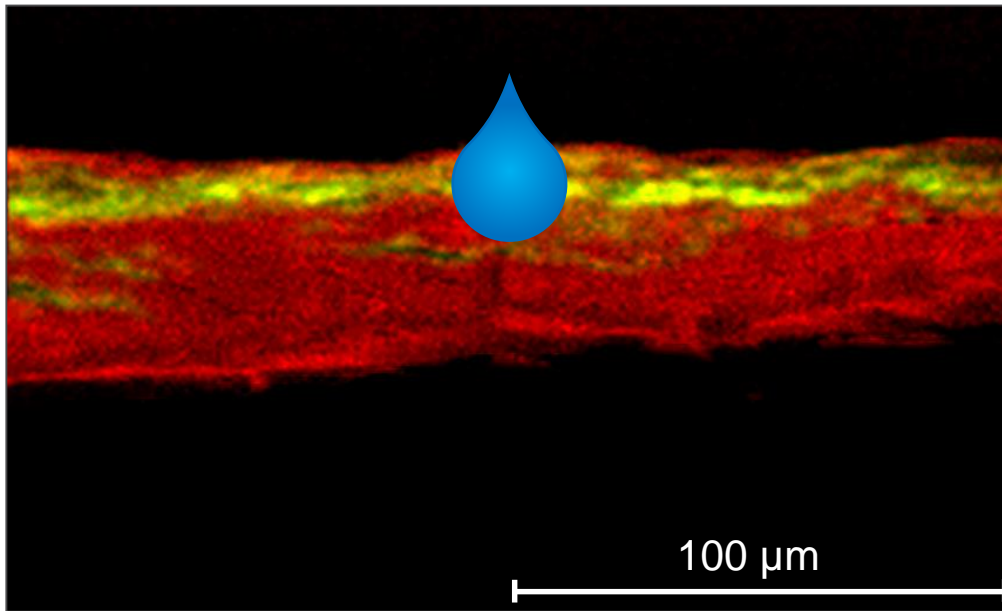
1. Definition: Tactile impression = human sense of touch based on passive contact
2. Definition: Lip-release effect = the release of contact between the human lips and the Tipping Paper
3. Reduction of the stickiness of the lips on the Tipping Paper = comfortable sensation during smoking
4. Production process: Coating of base paper with traditional or super lip-release substances



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LIP-RELEASE EFFICIENCY = ABSORPTION SPEED OF THE HUMAN SALIVA

- Cross-section image of Tipping Paper:

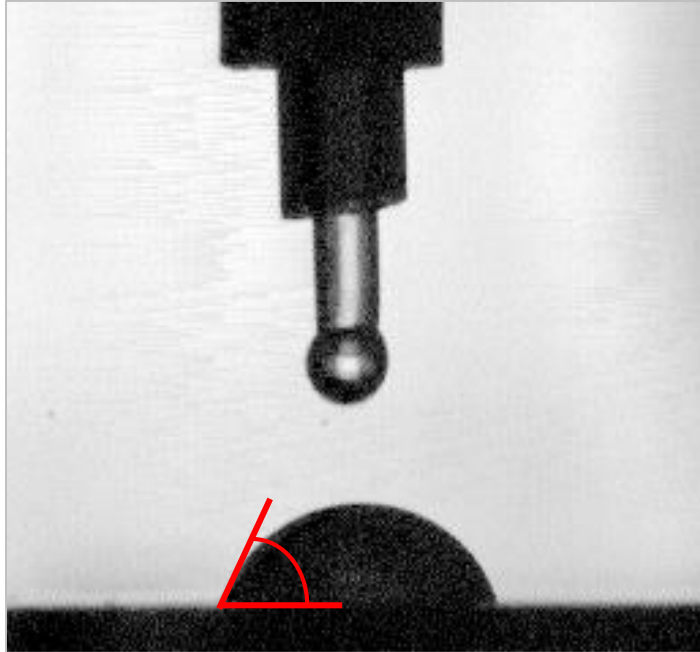


Lip-release layer (“barrier”)
Base paper section

1. The saliva gets slowly absorbed by the lip-release barrier
2. The liquid transport becomes accelerated in the pure base paper section

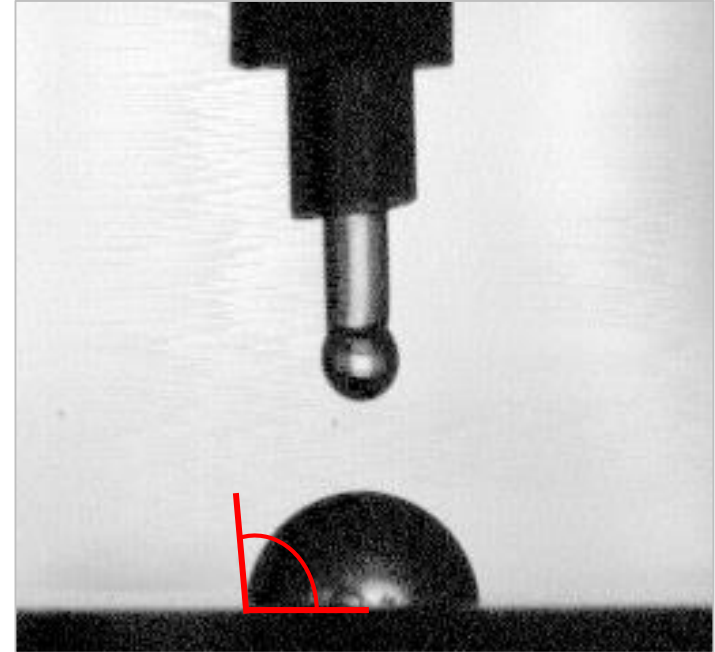
CONTACT ANGLE TEST: STANDARD vs. SUPER LIP-RELEASE TIPPING

- Standard Lip-Release Tipping:



- Water (saliva) repellency sufficient for “normal” smoking behavior

- Super Lip-Release Tipping:



- Superior (adjustable) hydrophobicity for special smoking conditions / specific consumers
- Confirmed pleasant feeling on the human lips

HAPTIC INTERACTION WITH THE CONSUMER: TEXTURED & SOFT TOUCH TIPPING

1. Definition: Haptic perception = active exploration of surfaces
2. Textured Tipping: Tipping materials with mechanically embossed surface structures for a haptic feeling on the consumers' lips and fingers
3. Soft Touch Tipping: Soft and velvety surface generated with printing technology



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▶ FEATURES OF TEXTURED TIPPING

- Basic principle: Web material is guided between surface textured rollers
- Embossing process: Related to physical principles / no chemical treatment = no conflicts with tobacco regulations
- Applicable under restrictive regulations (potentially “plain packaging” markets)
- Combination with special converting elements (e. g. hotfoil stamping)
- “What you see is what you feel” concept = imitation of textiles or natural materials



FEATURES OF SOFT TOUCH TIPPING

- Application of a soft touch varnish on the Tipping Paper
- Implies higher friction on the FMC / HTP mouthpiece surface
- “Multi-sensory” haptic (rubbery) effect on the smokers’ lips and fingers
- Matt and satiny appearance on dark surfaces
- The varnish is allowed for direct food contact and in positive compliance with the FDA



SENSORY INTERACTION WITH THE CONSUMER: AROMA (FLAVOR) TIPPING

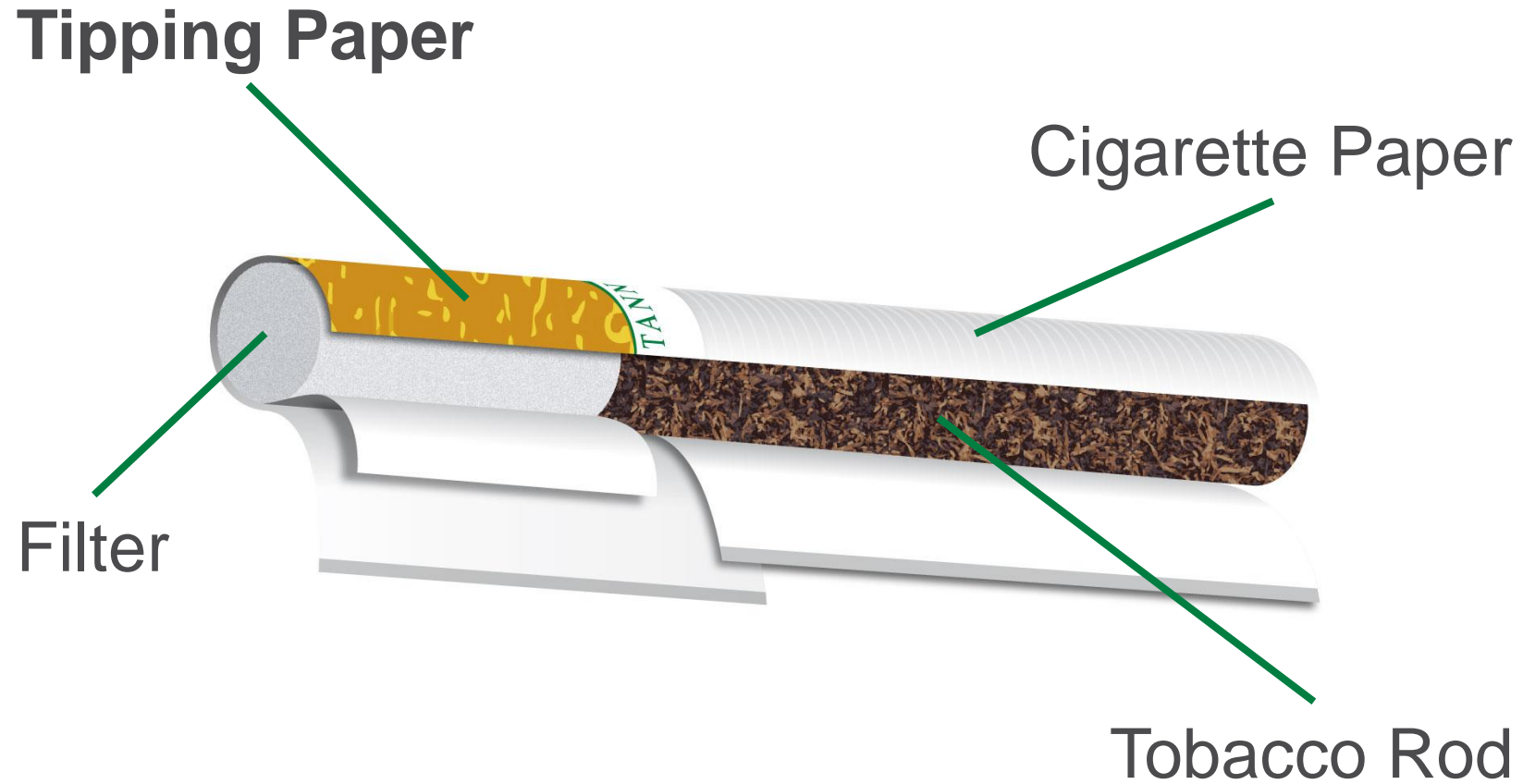
Definition: Tipping Paper with printed aromas or flavors to address directly the human sense of taste (lips, tongue)



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WHERE CAN AROMAS / FLAVORS BE APPLIED?



FEATURES OF AROMA (FLAVOR) TIPPING

- Substances applied on the non-burnt / non-heated part of the FMC / HTP = no toxicological concerns (no pyrolysis products)
- Support / enhancement of the FMC's / HTP's characteristic taste ("multi-sensory" experience)
- Basic flavors: Sweet, sour, cool and hot with different intensity levels
- Combination of aromas possible
- Shelf-life = 6 – 12 months
- Cooperation with aroma experts from the tobacco and food industry



FUNCTIONAL INTERACTION WITH THE CONSUMER: SMOKE YIELDS AND TEMPERATURE REDUCTION

Development of functional filter plug wrap paper = printed active substances with the purpose to

1. reduce gaseous deliveries
2. lower the thermal energy of the FMC / HTP smoke



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FEATURES OF FILTER PLUG WRAP PAPER

- Low-substance paper fully enclosing the filter material (e. g. cellulose acetate)
- Provides the required roundness of the filter rod and the optimal shape of the filter plug
- Available in non-porous form for online-laser perforated FMCs / HTPs or
- with various permeability levels through natural pores for the combination with pre-perforated Tipping Paper
- Is located underneath the Tipping Paper = no direct access to the human lips and fingers
- May interact with the aerosol inside the filter



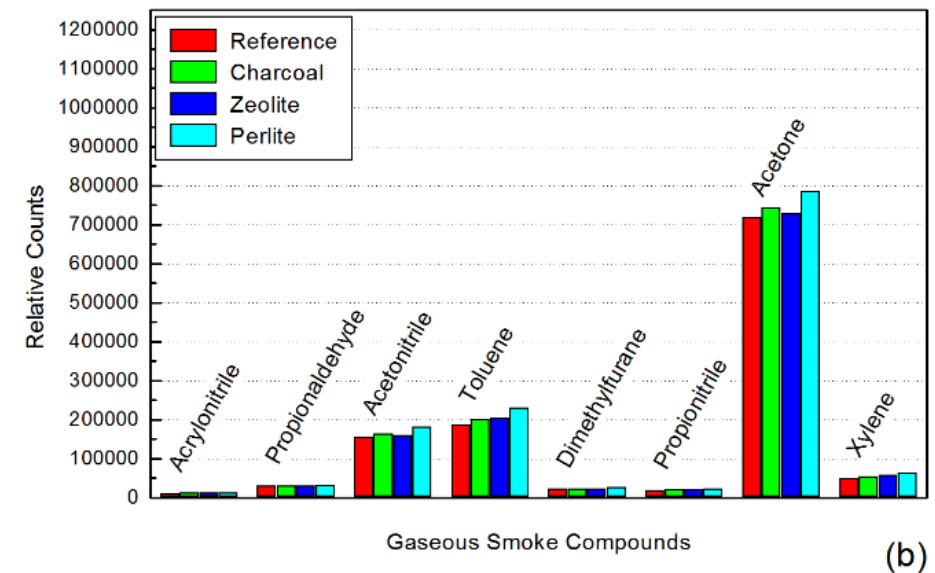
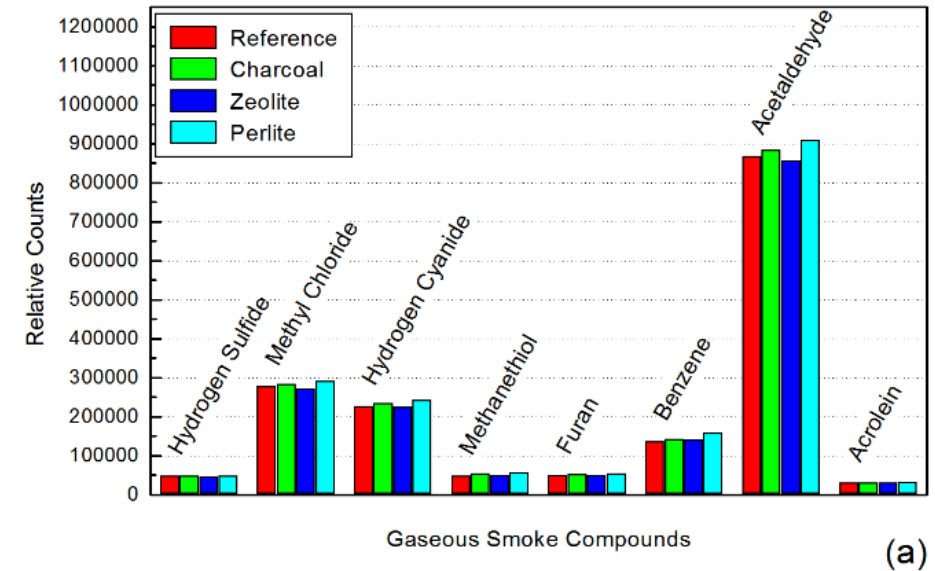
REDUCTION OF GASEOUS SMOKE CONSTITUENTS

- Rotogravure printing technology for the coating of plug wrap paper with active substances
- Manufacturing of FMC / HTP samples + quantitative smoke yields analysis carried out by Hauni Maschinenbau GmbH in Hamburg, Germany
- 1st approach:
 - Investigation of non-ventilated FMCs with conventional cellulose acetate filters
 - Standard non-porous plug wrap paper uncoated (reference) & coated with charcoal (activated carbon), zeolite and perlite
 - Analysis of gaseous combustion products



REDUCTION OF GASEOUS SMOKE CONSTITUENTS

- FMC results (non-ventilated):
 - No significant differences between the active coatings and the reference plug wrap paper
 - The filter prevents the mainstream smoke from having sufficient contact with the coating on the plug wrap paper
 - The aerosol is concentrated in the filter core
 - Filtration dominates the control of smoke yields



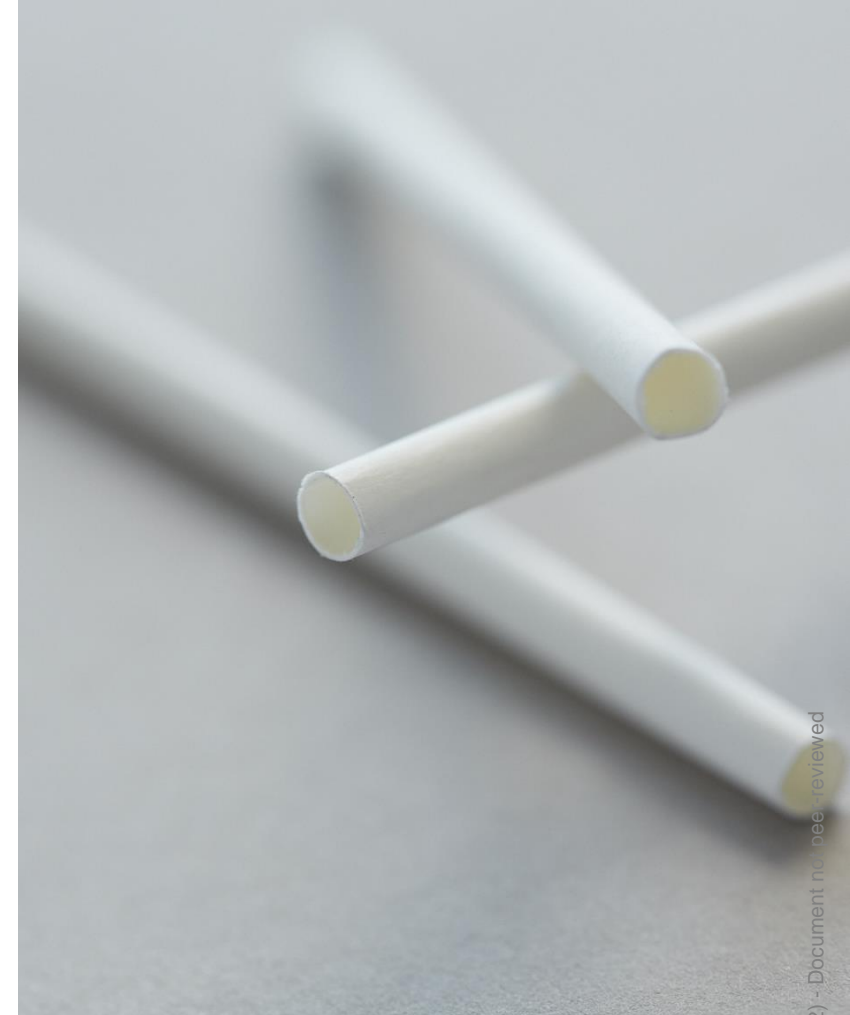
REDUCTION OF SMOKE CONSTITUENTS

- 2nd approach:
 - Hollow paper tubes as part of the complex filter construction (including cellulose acetate segments) of HTPs
 - High-grammage plug wrap paper (100 g / m²) coated with activated carbon
 - Analysis of specific aerosol compounds (nicotine, glycerol & water)
- HTP results (non-ventilated):
 - Nicotine & glycerol = no significant differences
 - Water = 50% increase
 - Deeper investigations necessary!



REDUCTION OF THE THERMAL ENERGY OF THE HTP AEROSOL

- Commercially available HTPs heat the tobacco rod up to 300°C – 400°C for nicotine release
- HTPs are relatively short compared with FMCs = low cooling rate of the smoke within the HTP = may cause an uncomfortable perception during the puffing process
- Idea:
 - Same high-grammage plug wrap paper tube filter segments coated with poly lactic acid (PLA; good heat absorptivity & biodegradability)
 - Temperature measurement of the emitted aerosol



REDUCTION OF THE THERMAL ENERGY OF THE HTP AEROSOL

- Measurement principle:
 - Temperature sensors introduced into the hollow filter part
- HTP result (non-ventilated):
 - Approx. 30% heat reduction in the section between the tobacco rod and acetate filter segment compared with uncoated plug wrap paper
 - Deeper investigations necessary!



SUMMARY

Functional filter wrapping materials establish an interacting link between FMCs / HTPs and the consumer:

1. **Tactile effects:** Super Lip-Release Tipping
2. **Haptic effects:** Textured and Soft Touch Tipping
3. **Sensory effects:** Aroma (Flavor) Tipping
4. **Physical effects:** Control of smoke yields & temperature



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**THANK YOU FOR YOUR VALUABLE
QUESTIONS & FEEDBACK!**



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