

METHODS FOR MEASURING THE ANTIMICROBIAL, MECHANICAL, AND PERMEABILITY PROPERTIES OF A BIO-BASED MULTILAYER ANTIMICROBIAL FILM

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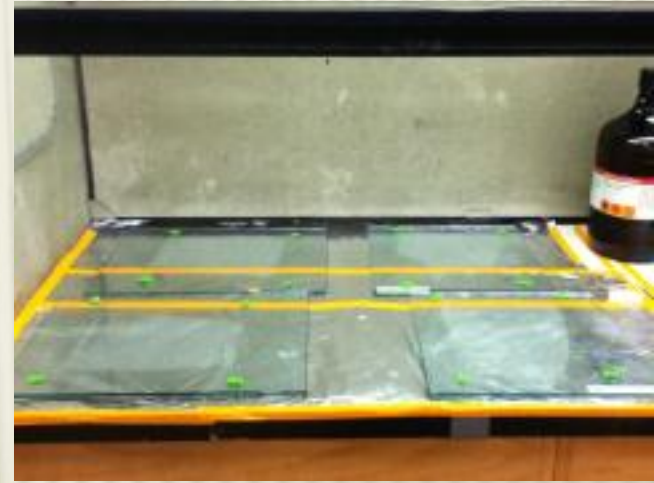
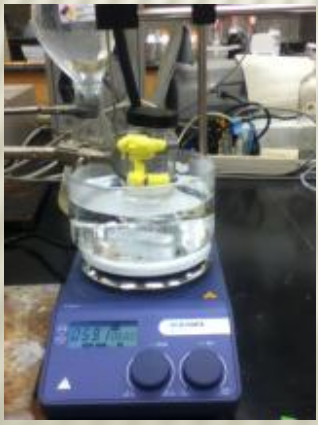
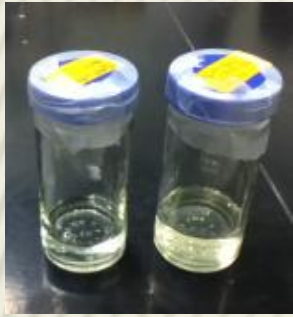
INTRODUCTION

- × Current Research
- × Methods
 - + Antimicrobial
 - + Mechanical
 - + Permeability
- × Conclusions

CURRENT RESEARCH

- × Development of a completely bio-based and biodegradable antimicrobial package for minimally processed food products
 - + Polylactic acid (PLA)
 - + Chitosan (CS)
 - + Grapefruit Seed Extract (GSE)

PLA/CS COATING



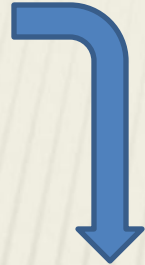
CS COATING



PACKAGING APPLICATION

Fresh Dice Tomatoes

Filling



Sealing



Storage



METHODS

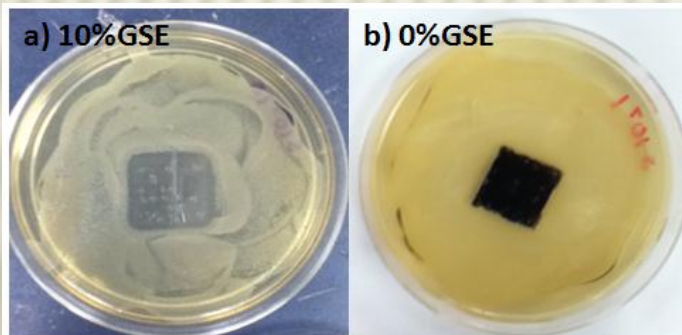
× Antimicrobial

+ Dynamic shake flasks (ASTM E2149)

- × Unsuitable for ASTM E2149 because of zone inhibition
- × Not representative of actual use conditions
- × No available nutrients for microorganisms to grow

+ Minimum inhibitory concentration (MIC)

+ Agar diffusion



+ Inoculation of 10^4 CFU/mL in tomato juice

METHODS

× Mechanical

+ ASTM D882 Standard test method for tensile properties of thin plastic sheeting

Treatment	Day	Machine Direction			Transverse Direction		
		Tensile Strength at Break (MPa)	Elongation at Break (%)	Tensile Modulus (MPa)	Tensile Strength at Break (MPa)	Elongation at Break (%)	Tensile Modulus (MPa)
0% GSE		77 a*	142 a	2683 a	111 a	78 a	3830 a
30% GSE	0	72 a	140 a	2663 a	106 a	77 a	3781 a
0% GSE		64 b	8 b	2983 b	68 b	18 b	3996 a
30% GSE	10	72 a	157 a	2860 c	101 a	78 a	3942 a

*Lowercase letters indicate significant differences between treatments (columns) ($p < 0.05$)

+ Equipment

× Instron Universal Testing Machine



METHODS

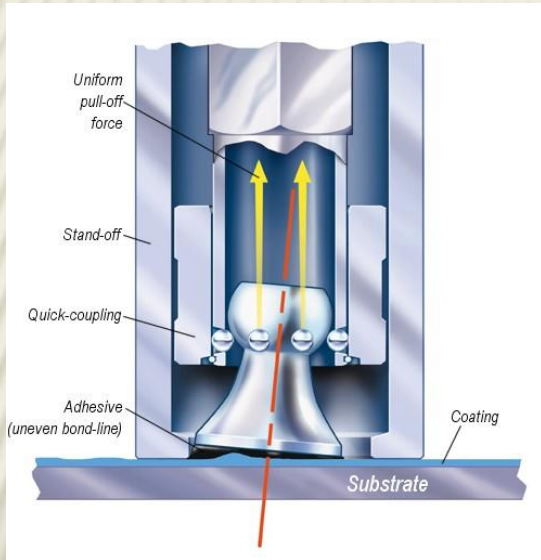
- × Mechanical

- + ISO 4624 Pull-off test for adhesion

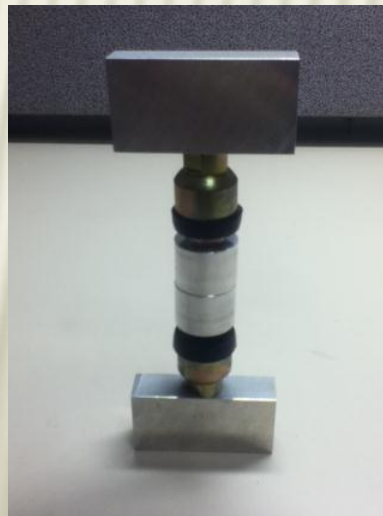
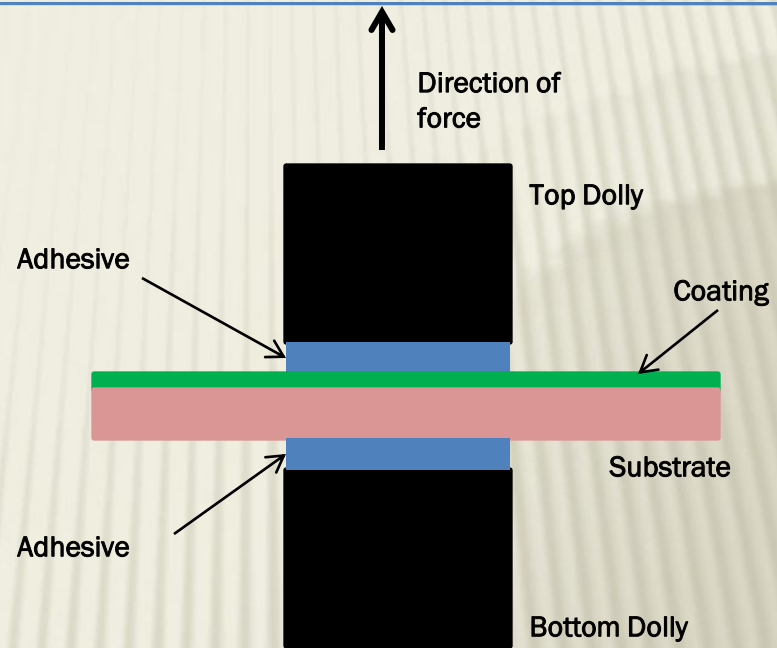
- + ASTM D4541 Standard test method for pull-off strength of coatings using portable adhesion testers

- × Equipment not available

PULL-OFF TEST



<http://www.defelsko.com>



METHODS

× Permeability

- + ASTM F1249 Standard test method for water vapor transmission rate through plastic film and sheeting using modulated infrared sensor
- + ASTM D3985 Standard test method for oxygen gas transmission rate through plastic film and sheeting using a coulometric sensor

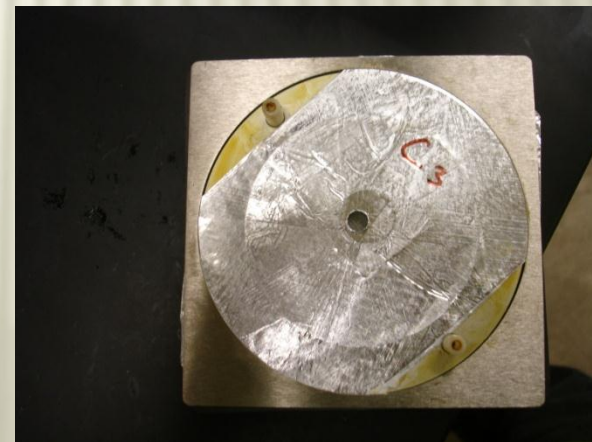
METHODS

× Permeability

+ Equipment

× Mocon Oxtran (oxygen)

× Permatran (water vapor)



CONCLUSIONS

- × Standard methods are useful for validated testing in research
 - + Testing can be done more reliable and quicker with validated methods
- × Developed methods are used when the standard methods do not apply to the research conditions

THANK YOU!!!