

# **The pulping and deposition of macro stickies**

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# What are stickies?

Stickies in paper recycling are believed to be a mixture of

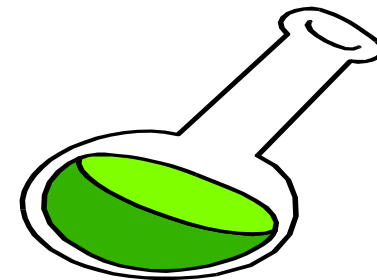
----Hot melts adhesives

----Pressure-sensitive adhesives (PSA's)

----Wax

----Coating

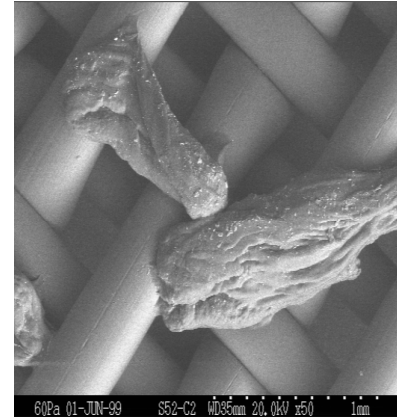
----Wood derived extractives



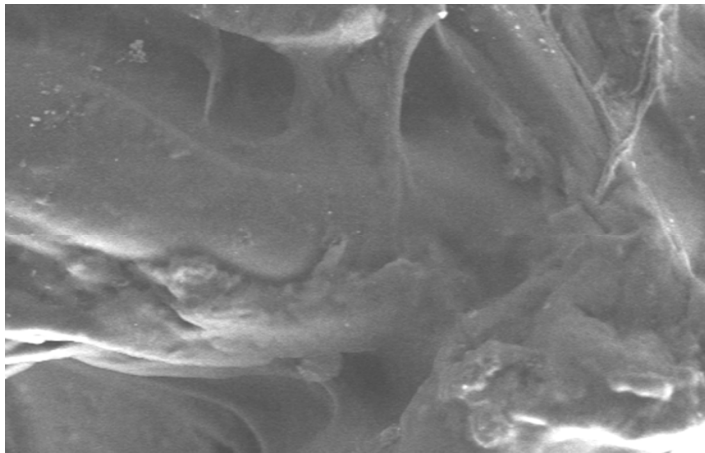
# Stickies

A sticky particle

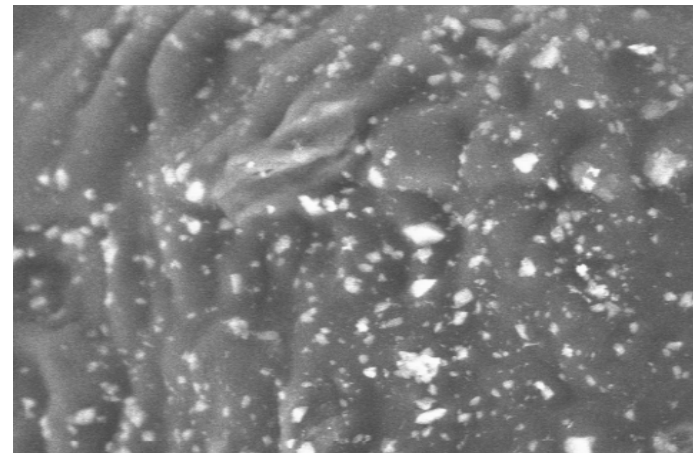
- is typically hydrophobic
- is tacky and depositable
- often adsorbs particulates/dissolved species
- Examples of adsorbed species might include talc, Calcium Carbonate, Inks, Toners, polymers ...



\*The actual surface behavior of stickies depends on the adsorbed species.



PSA Surface



PSA Surface with CaCO<sub>3</sub>

# Stickies-Related Problems

- Product quality
  - Dirty spots in paper \*
- Operational problem
  - Deposition on machine \*
  - Breaking web

\* Affected by adsorbed species.

# Control and Removal Methods for Stickies

- Mechanical removal \*
- Chemical control \*
- Use of environmentally benign adhesive  
(recyclable adhesive)
- Control of waste paper quality
- Physical adsorption to paper fibers \*
- Others

\* Affected by adsorbed species.

# **The effect of pulping conditions on the size of stickies after pulping**

- Objective: how do components present in the pulper affect the size and shape of stickies after pulping
- Agglomeration?

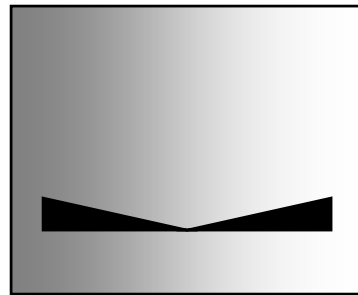
# List of Furnishes

- **Copy Paper, alkaline**
  - $\text{CaCO}_3$  (11%)
- **SW Market Pulp**
  - pH = 5.0, 5.7, 9.5
- **Bristol Paper**
  - 2% Rosin, 4% Alum, 10% Cationic Starch
- **Market Pulp +**
  - $\text{CaCO}_3$  (11%)
  - Talc (11%)
  - Clay (11%)
  - Sized with AKD
  - Cat Starch (1.5 & 10%)
  - Alum (4%)

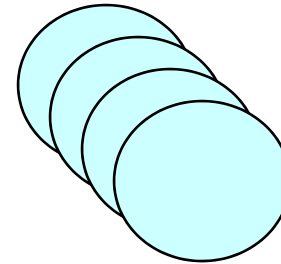
**All furnishes contained 0.5% acrylate based PSA.**

# Pulping Experiment Procedure :

**400 g OD Pulp**  
**2 g adhesive**

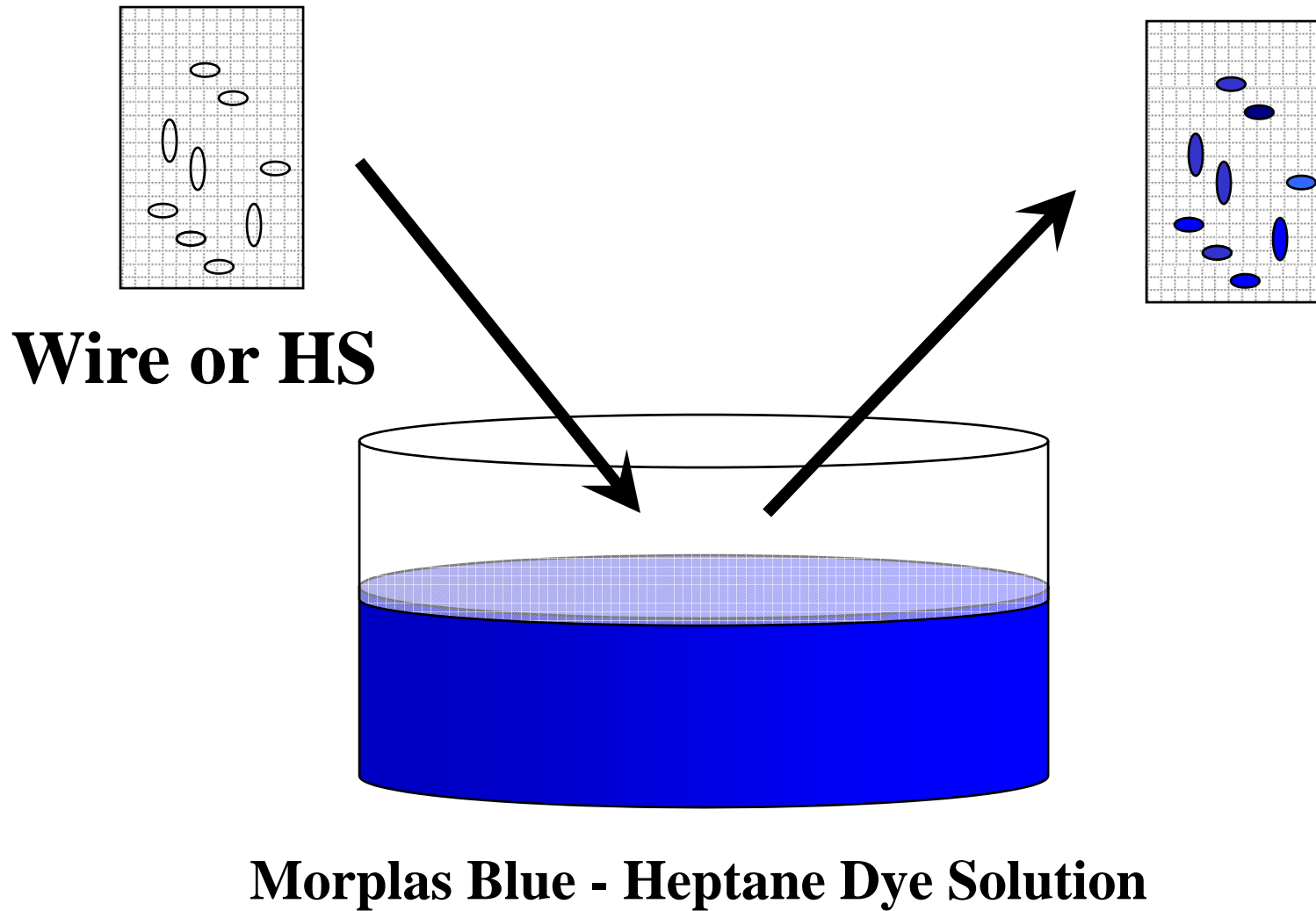


**PULP**  
**12%K, 40 C**  
**30 min**



**HANDSHEETS**  
**Dyeing**  
**Image Analysis**

# Dyeing Stickies for Contrast Enhancement



# Image Analysis:

Apogee Image Analysis System

HP ScanJet 4C

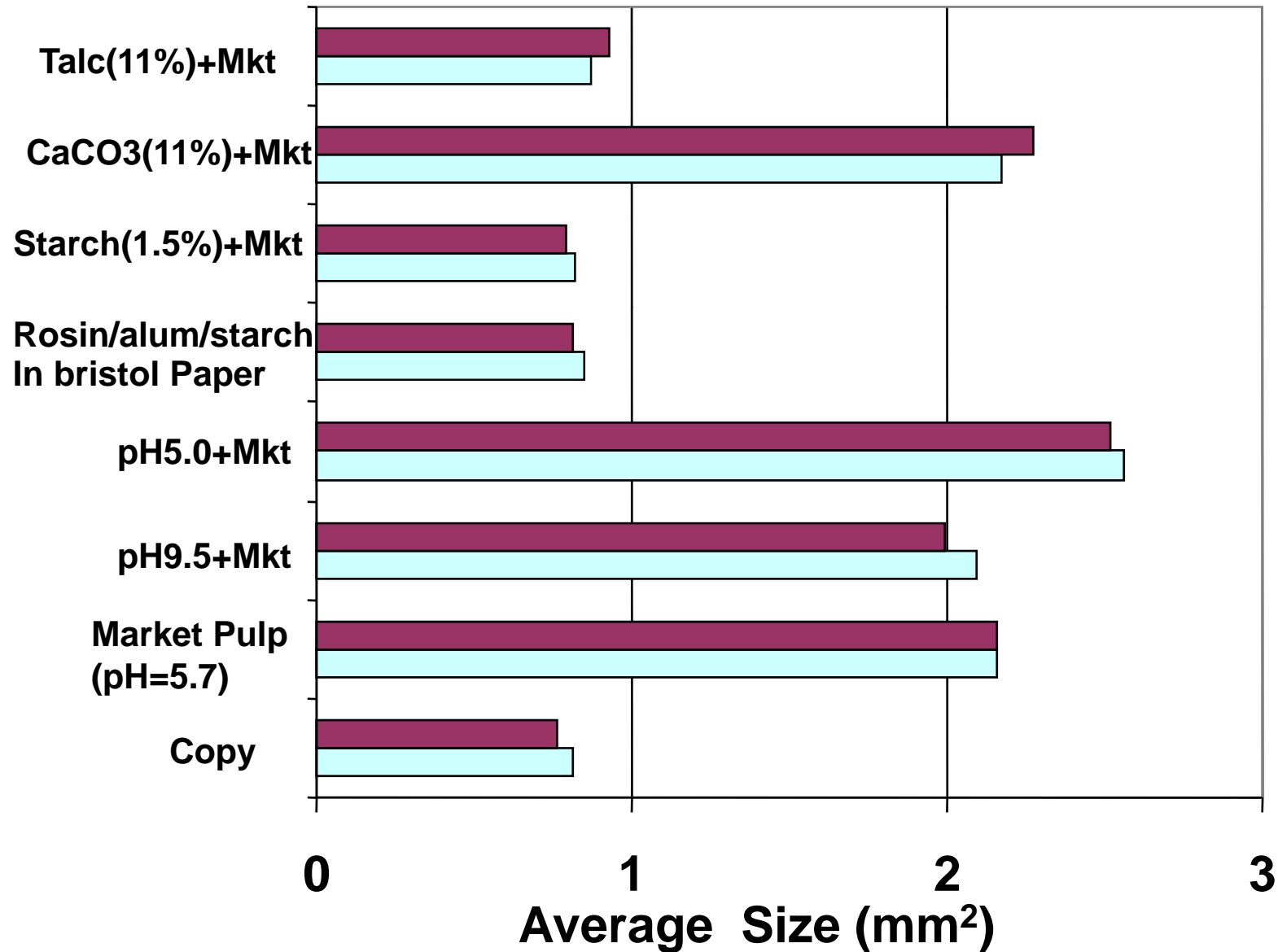
600 dots per inch

Threshold: 80% Avg. GSV

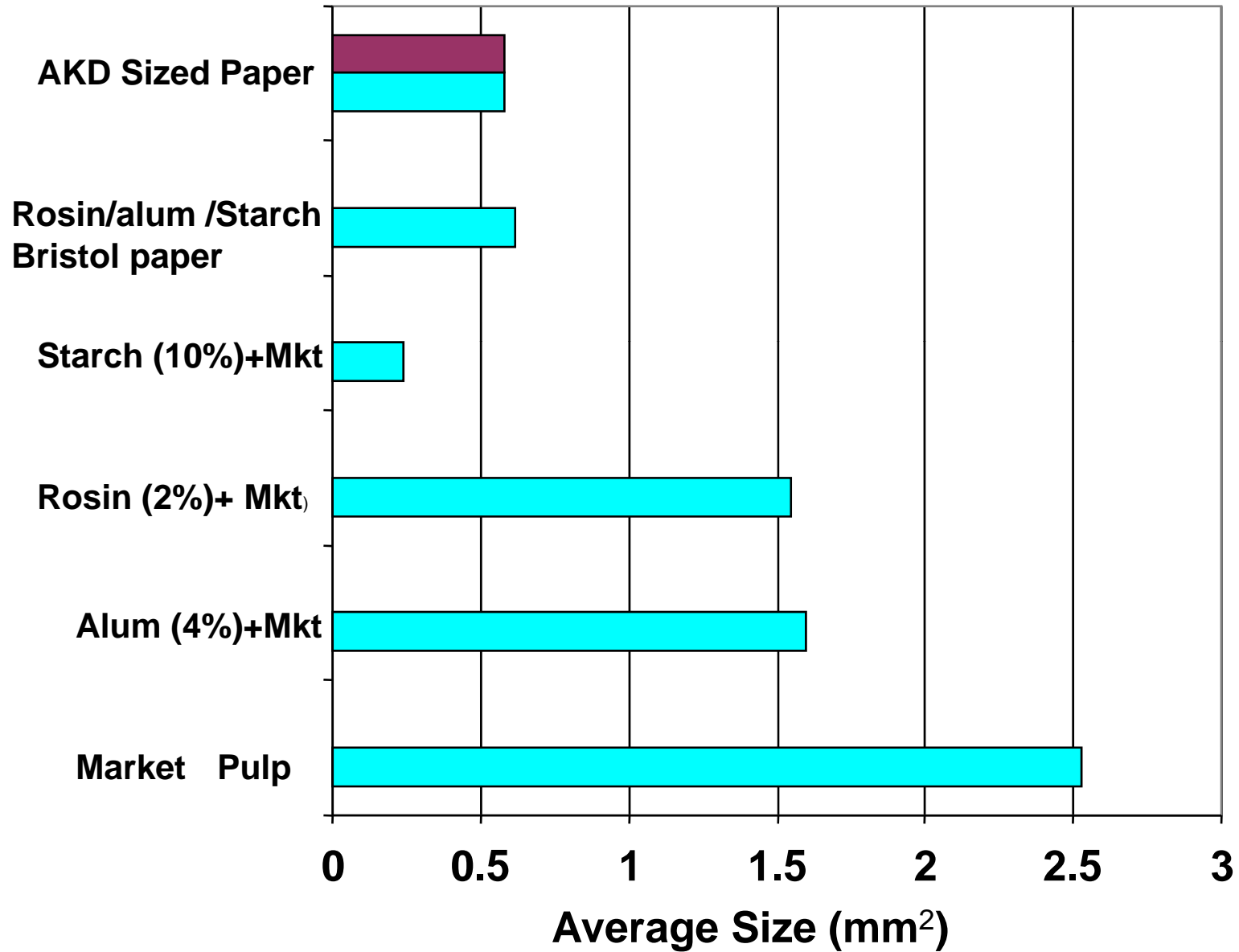
Both sides of 4 PM Wires



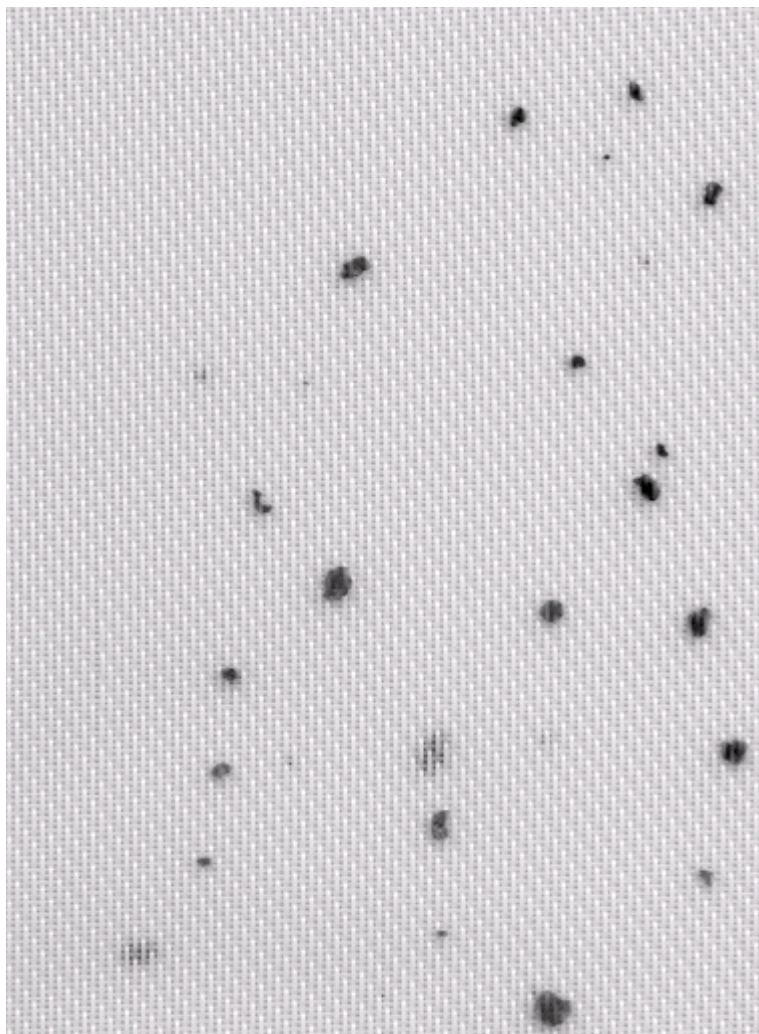
# Effect of Papermaking Components on Stickies Average Size After Pulping (Maelstrom Pulper)



## Effect of Papermaking Components on Stickies Average Size after Pulping ( 450H Pulper)



# MARKET PULP



# COPY PAPER

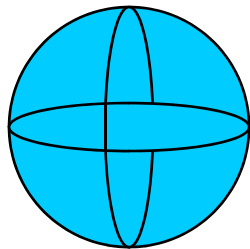


# Effect of Paper Making Components on the Shape Stickies

Market Pulp (pH=5, 5.7, 9.5)

Clay

CaCO<sub>3</sub>



Copy Paper

Rosin/alum/starch

Mkt Pulp w/ Cat. Starch

Mkt Pulp w/ Talc



# A closer look at polymer adsorption on stickies agglomeration

- To understand the process of the stabilization of stickies (prevention of agglomeration or deposition) by starch.

- Objective

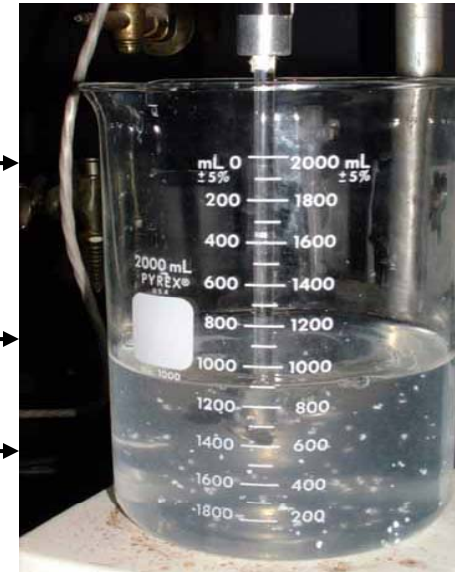
- To understand the process of the stabilization of stickies (prevention of agglomeration or deposition) by starch.

# Experimental Procedure

**Deionized water**

**0.2 gram of PSA particles (collected  
from reject of lab screen)**

**Poly-DADMAC or starch**



**45°C for 8 hours**

# PSA Particle Aggregates (no chemicals)



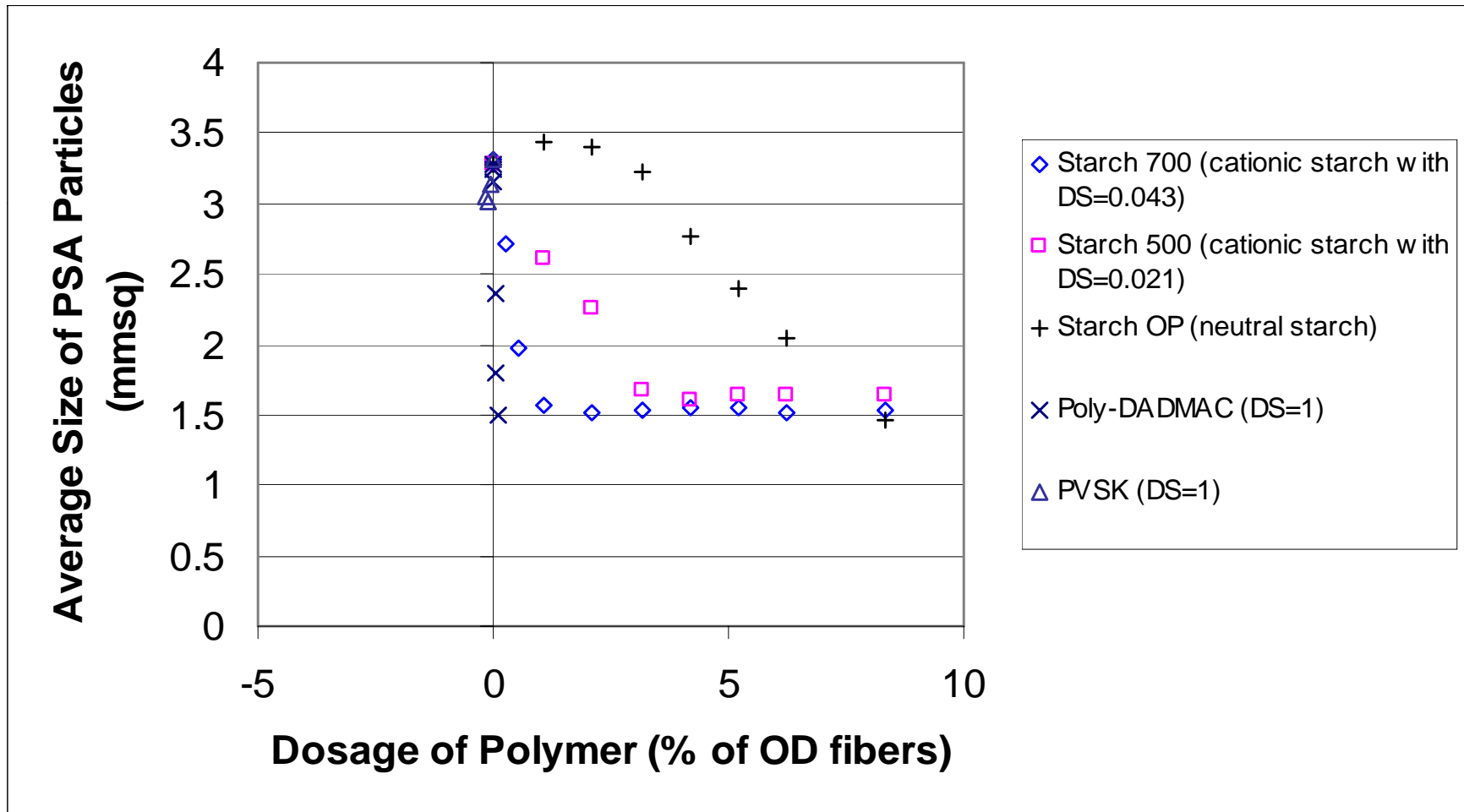
PSA Particles  
Gentle Stirring  
(0.05% Cat Starch solution)



# Concentration and Charge of Poly-DADMAC

Poly-DADMAC		
Concentration (g/liter)	Charge ( $\mu$ eq/liter)	Result
0	0	Agglomerate
4.83E-5	0.3	Agglomerate
6.44E-5	0.4	No agg.
9.66E-5	0.6	No agg.
1.45E-4	0.9	No agg.
2.42E-4	1.5	No agg.
4.84E-4	3.0	No agg.

# Effect of Starch Stabilization on PSA Particles

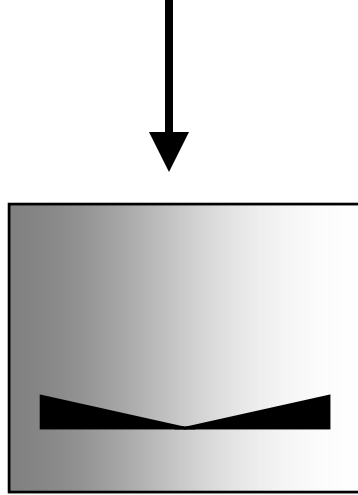


# **Stickies deposition on papermachine fabric**

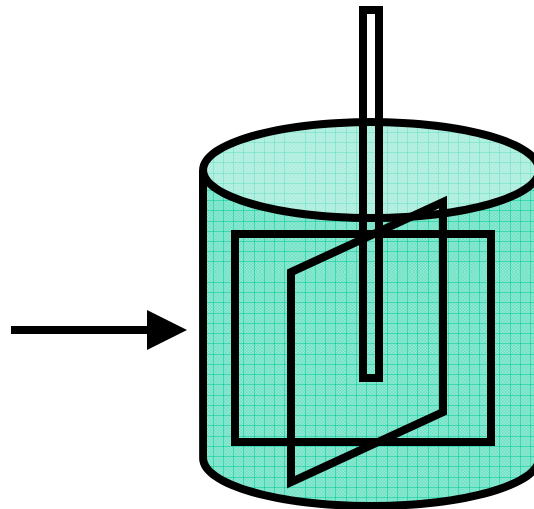
- Objective: determine how components present in the pulper affect the deposition of stickies on papermachine fabric

# Deposition Procedure:

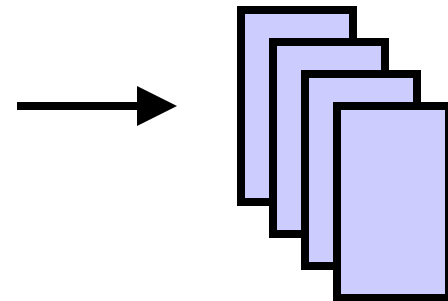
**400 g OD Pulp**  
**2 g adhesive**



**PULP**  
**12%K, 40 C**  
**30 min**

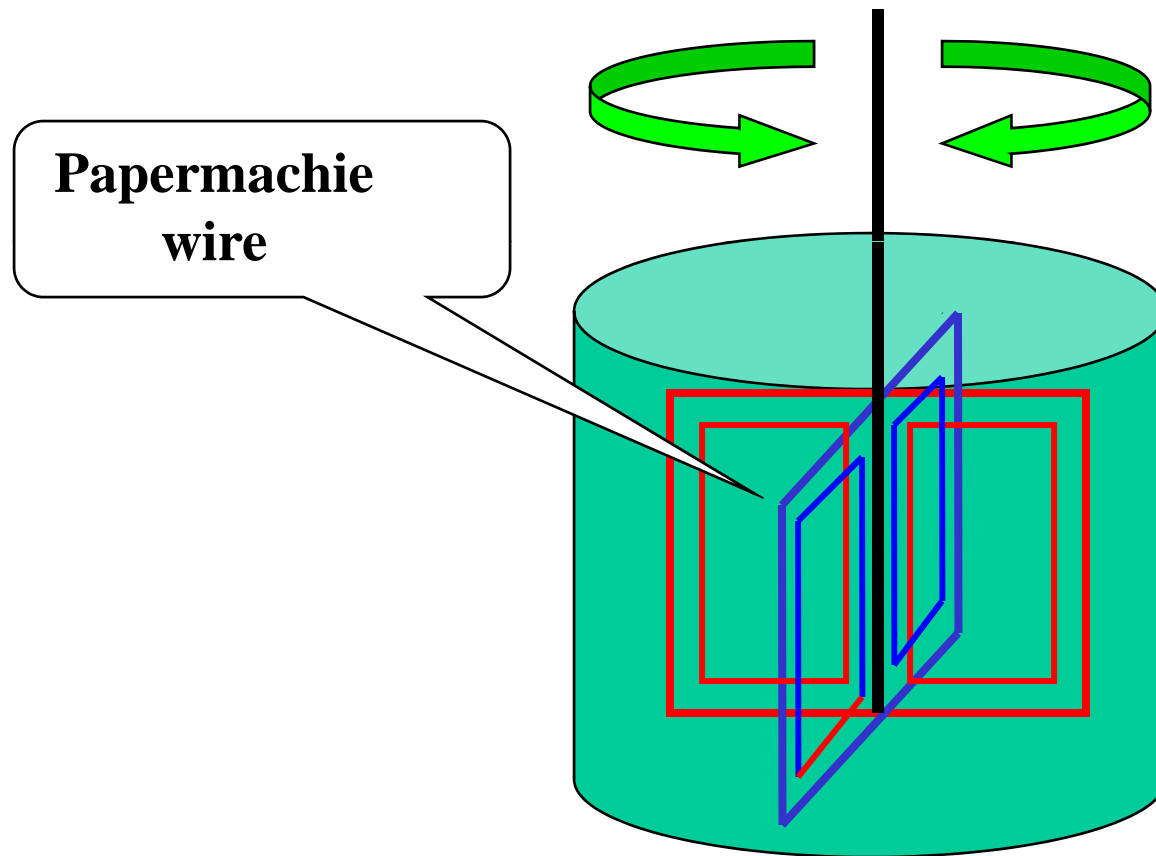


**DEPOSITION**  
**0.5%K, 50 C**  
**30 min**

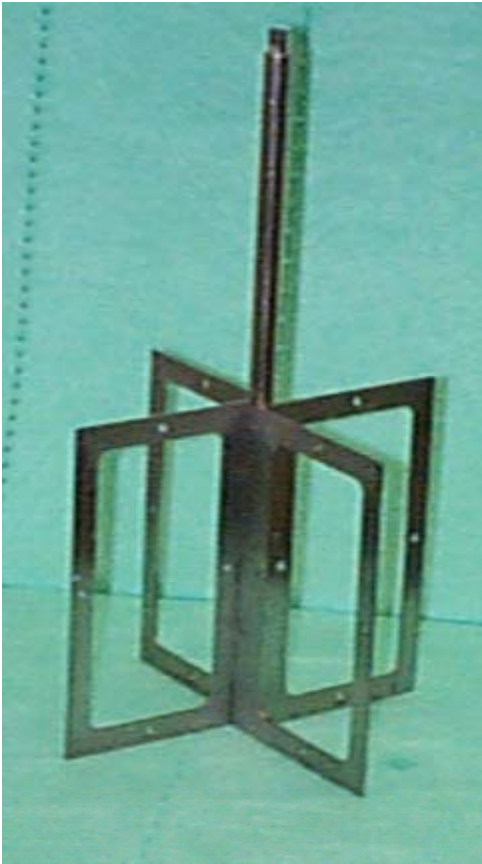


**PM Wires**  
**Dyeing**  
**Image Analysis**

# Stickies Deposition Tester



# Stickies Deposition Tester



Motor



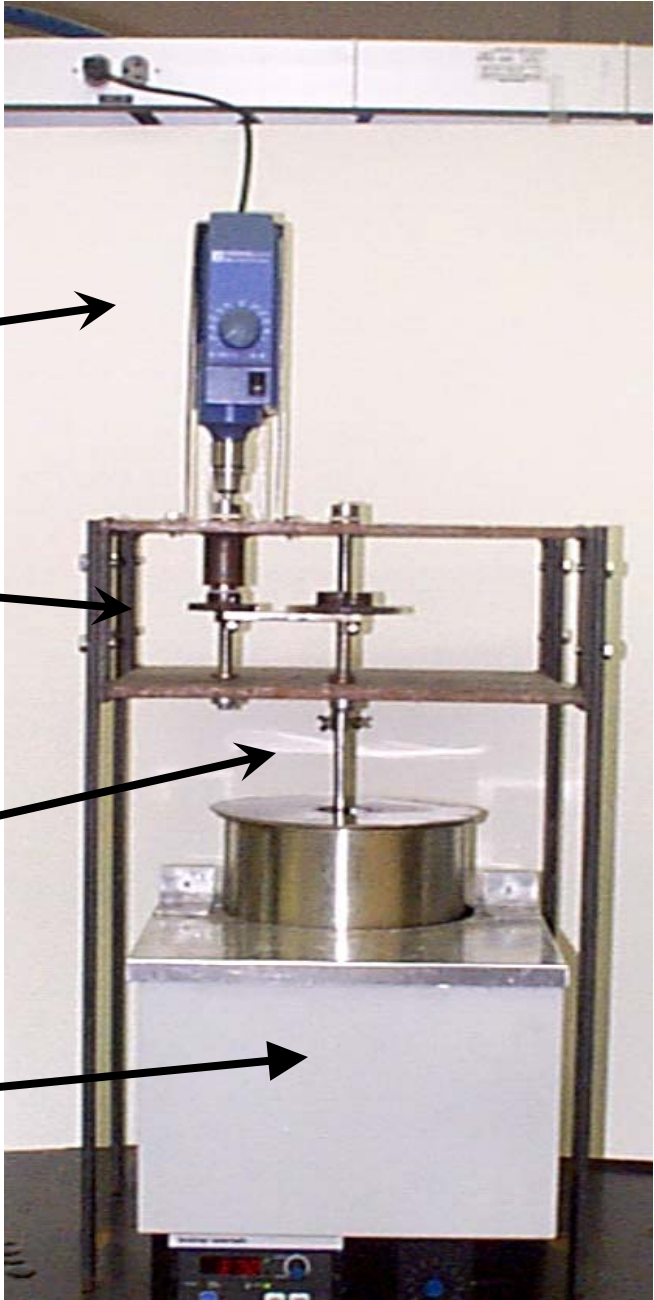
Gears



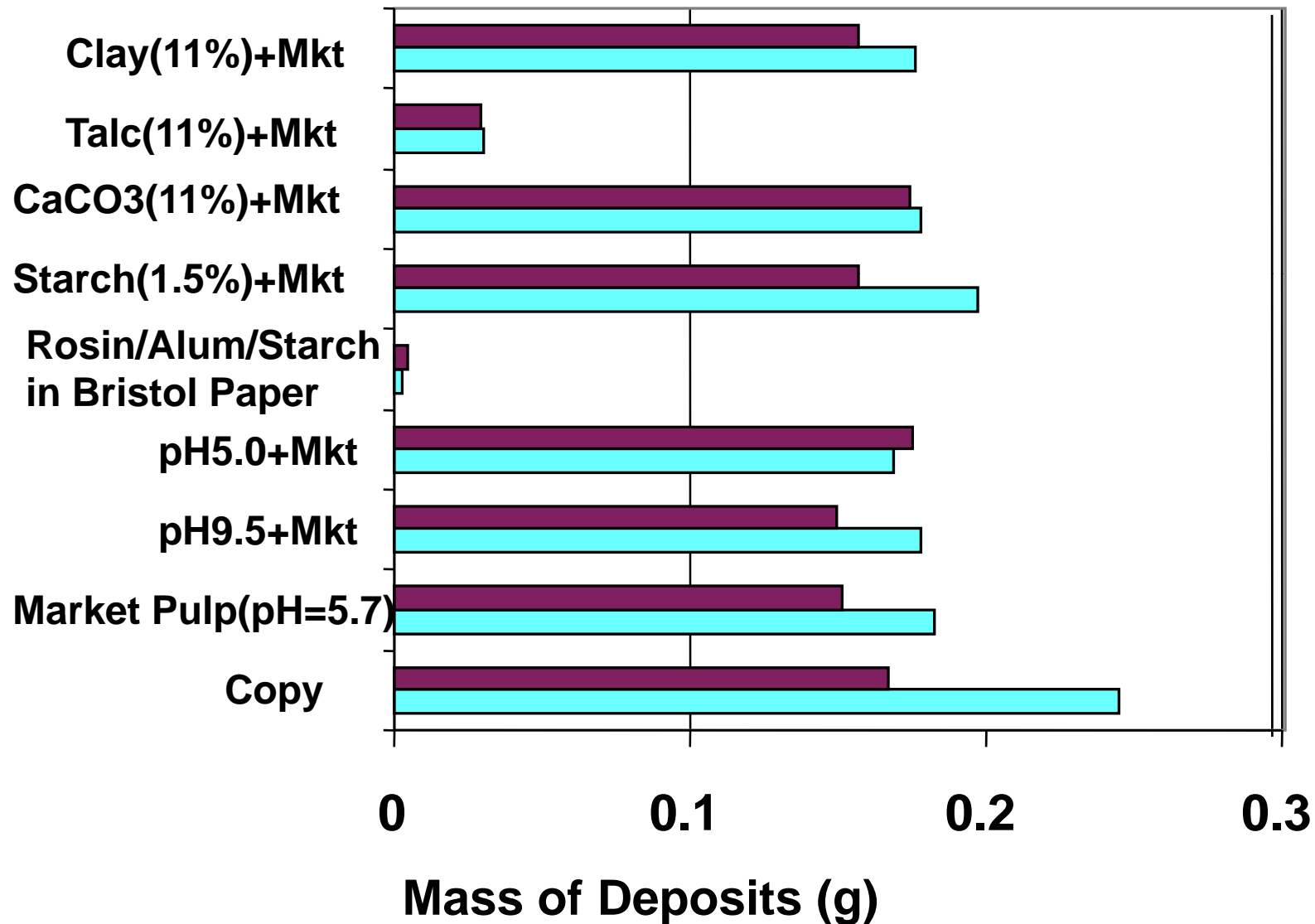
Paddle



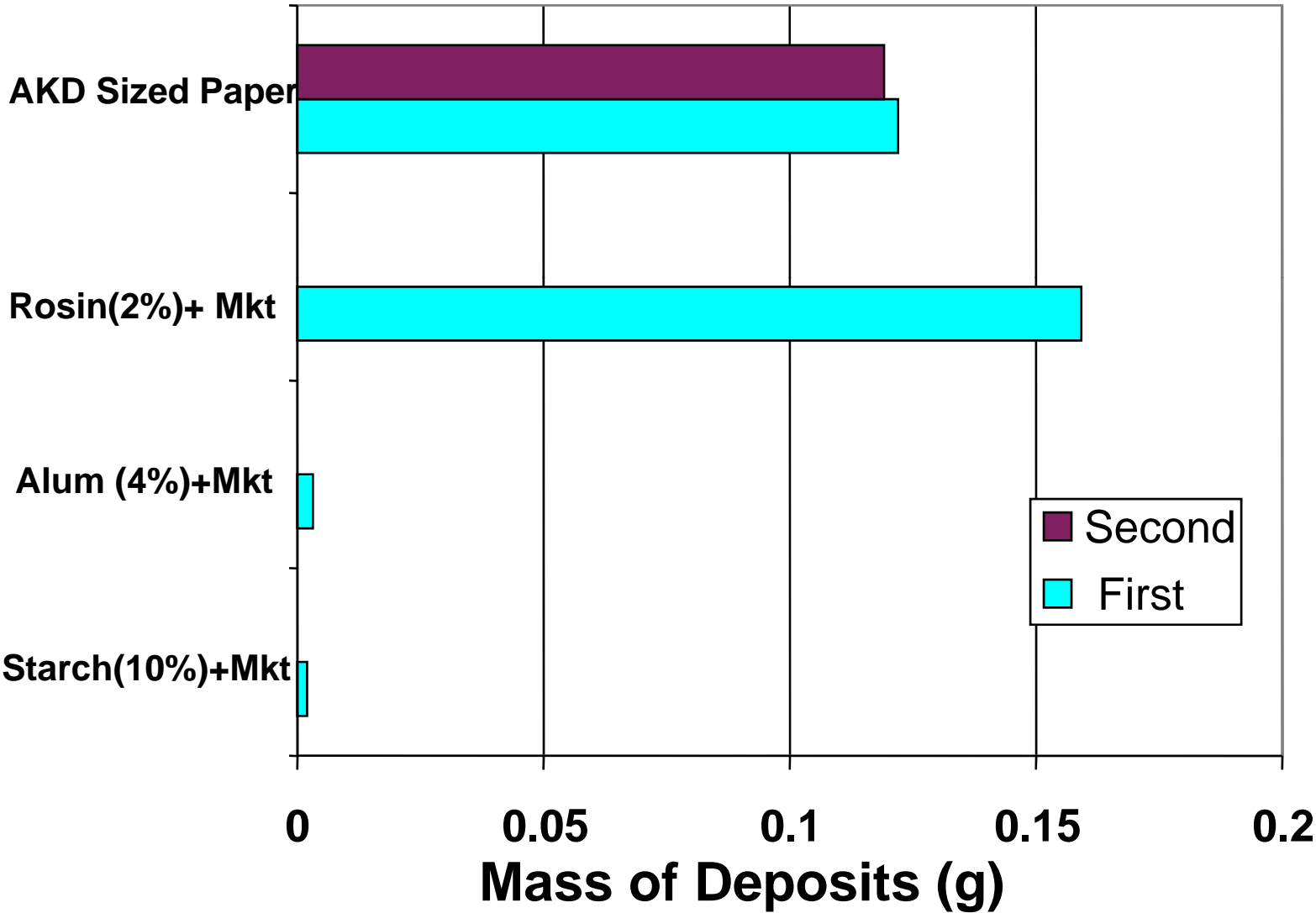
Water Bath



## Stickies Deposition (Weight Method) for Various Papermaking Components (Maelstrom Pulper)



# Stickies Deposition (Weight Change) for Various Papermaking Components (450H Pulper)



# Major Findings:

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- The stickies will self-agglomerate in pulper without the interference of chemical additives
- Components in copy paper like cat starch can disperse the stickies and make them more string-like
- Cationic starch, alum and talc can prevent deposition of the stickies very effectively