

# EFFECTS OF CHEMICAL SURFACE COATING (*RAIN-Z™*) ON THE POWDER YIELD OF SPRAY-DRYING: A PRELIMINARY APPROACH

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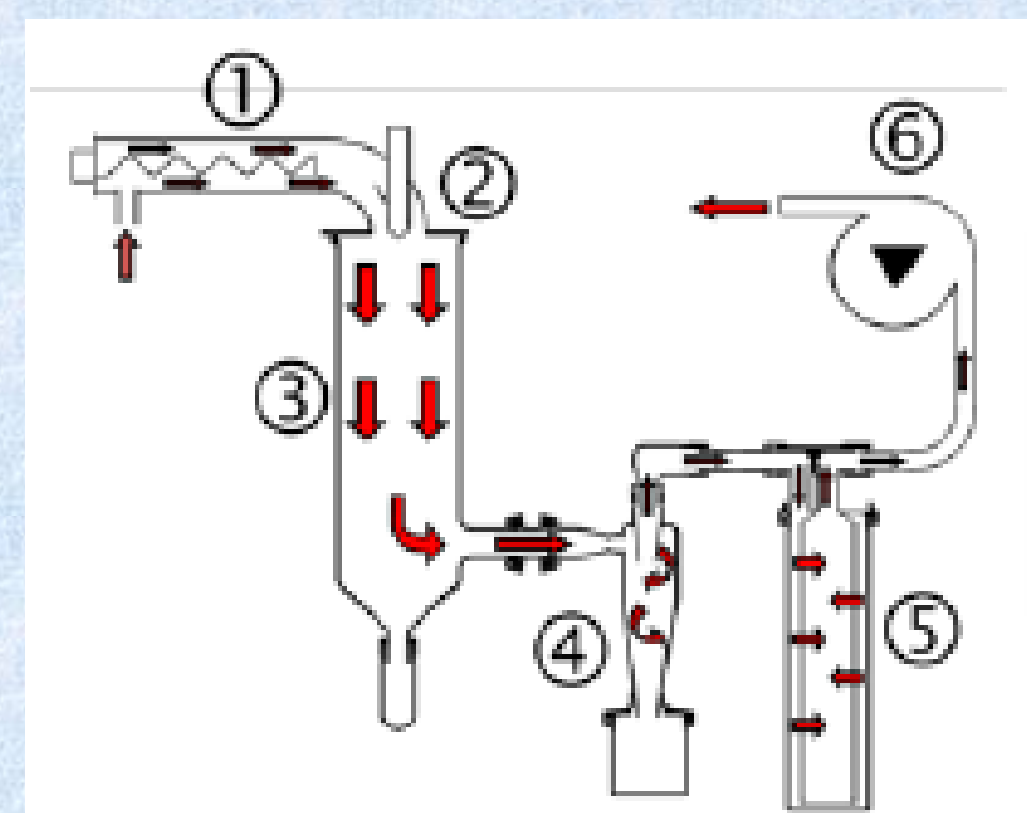
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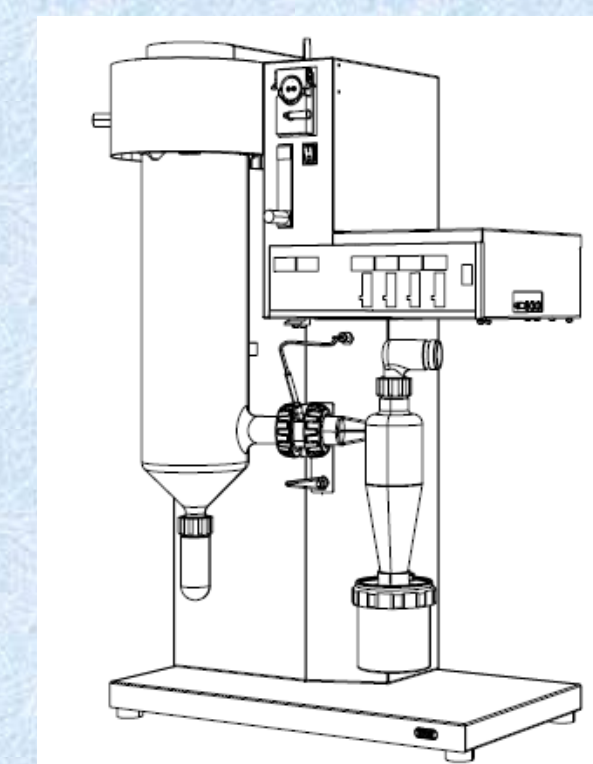
Spray-drying is the liquid food drying method where stickiness and wall deposition has most commonly been a major issue. For that reason, the efficacy of chemical surface coating was introduced to reduce stickiness and improve product recovery. The glass drying chamber was coated with a commercially available water repellent product Rain-Z™. The drying chamber was homogenously polished twice prior to physico-chemical analysis. The hydrophobicity and morphological properties were determined by means of goniometer, SEM and FTIR respectively. From the results obtained, the exposure of Rain-Z™ has increased significantly the product recovery ( $p < 0.05$ ). However, the productivity was decreased as the cycle increased ( $p < 0.05$ ). This was possibly due to thermal degradation. Moreover, the treated glass shows higher contact angle (2.6-fold increase) than the untreated ( $p < 0.05$ ). In fact, the SEM images of the treated glass showed rough surfaces as to indicate its hydrophobicity shifting. Meanwhile, powdered samples determined by FTIR show similar spectra trend detected on each functional group of both samples which suggested that there was no foreign residual left. These findings suggested that the proposed technique did not change the original composition of the dried powder and complies with the Syariah principle and halal for consumption. In summary, we reported that a simple surface modification using the commercially available product on the drying chamber has successfully proven to be one of the potential approaches to increase yield and productivity besides reduce the product wastage.

Spray drying process involves complex interactions between process, apparatus and feed parameters which all have an influence on the final product quality (Chegini et al., 2008). It is the liquid food drying method where stickiness has most commonly been a major issue. The powder may deposit on the wall or blockage may occur in the duct or cyclone (Bhandari & Howes, 2005).

This research is attempted to increase the efficiency of spray dryer by increasing its product recovery through chemical surface treatment on the glass surface of drying chamber and cyclone of spray dryer.



1. Air heating
2. Droplet formation
3. Spray drying
4. Particle collection
5. Outlet filter
6. Removing gas



## MATERIALS

- PG Rain-Z™ DURA
- Strawberry flavoured milk (Dutch Lady)
- Microslide (Borosilicate, 76mm x 26mm x 1mm)
- Spray dryer (Büchi, B-290)

## SPRAY DRYING PROCESS

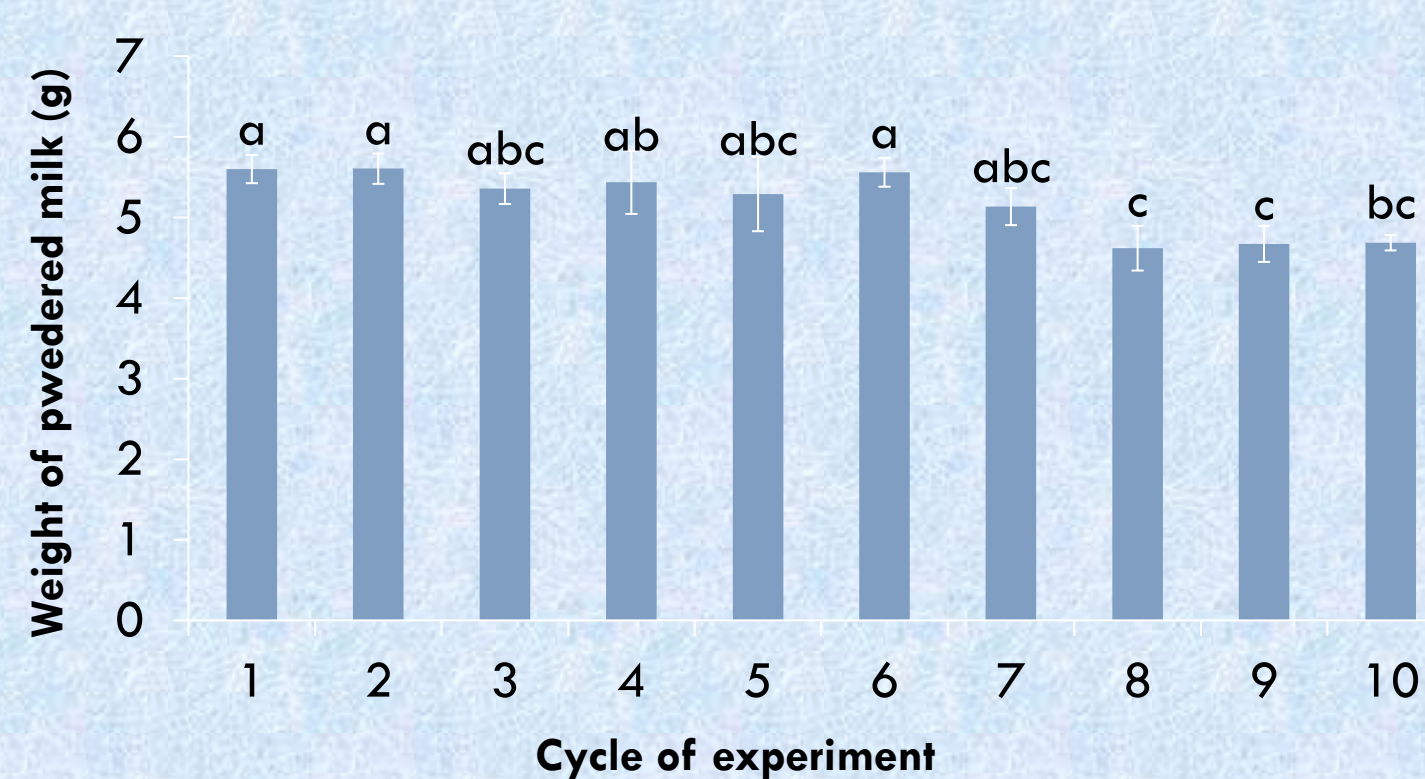
## ANALYSES

- Product Recovery
- Contact Angle
- SEM
- FTIR

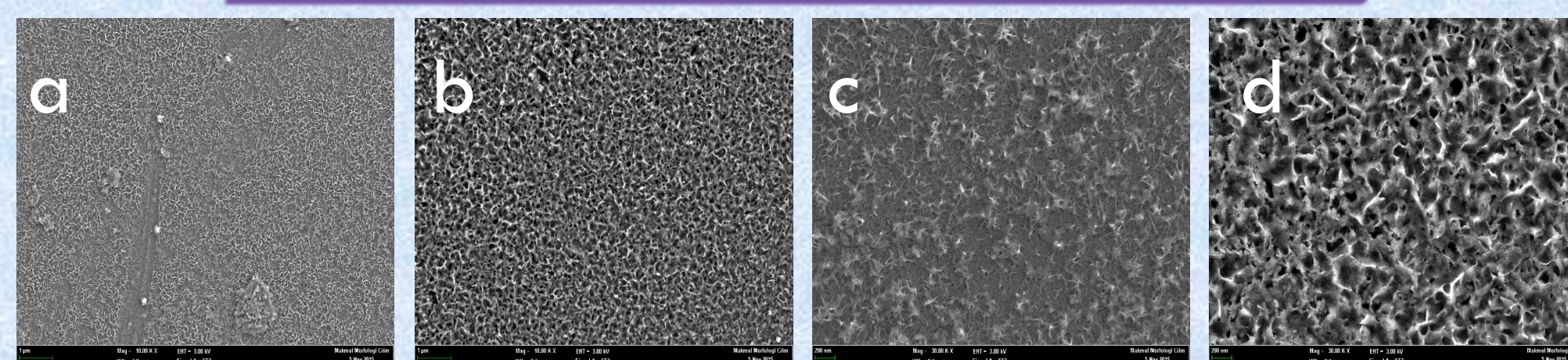
## RESULTS

### PRODUCT RECOVERY & CHEMICAL EFFICACY

Sample	Weight of powdered sample (g)
Milk (before treatment with Rain-Z) - Control	$4.31 \pm 0.04^b$
Milk (after treatment with Rain-Z) - Treated	$5.61 \pm 0.07^a$

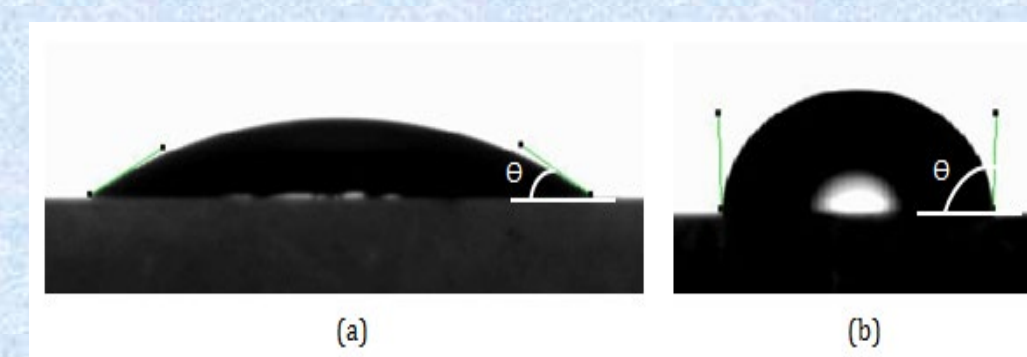


### SCANNING ELECTRON MICROSCOPE (SEM)

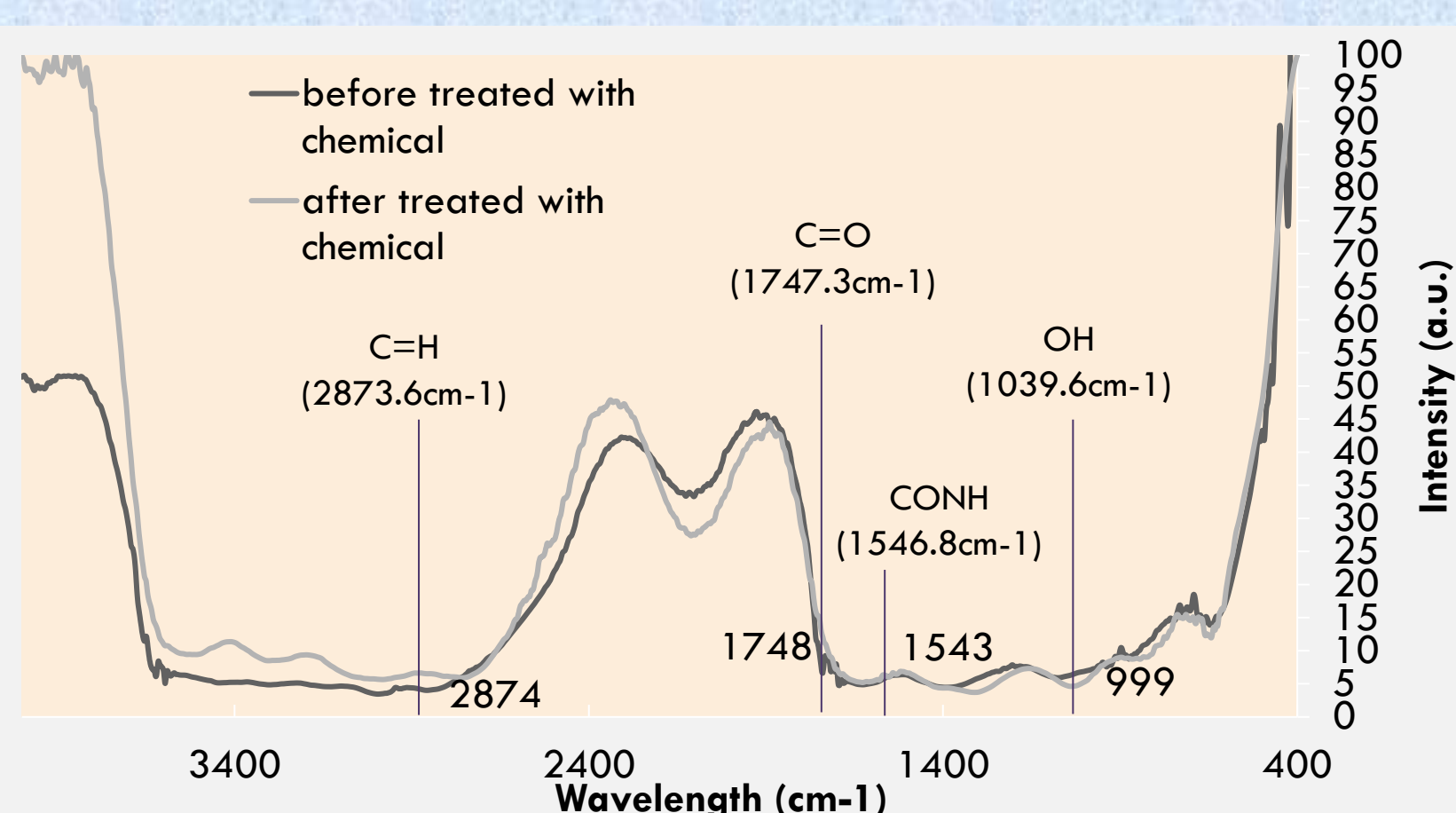


### CONTACT ANGLE

Sample	Surface physico-chemistry [Contact angle, $\theta$ ]
Untreated glass	$35.74 \pm 0.06^b$
Treated glass	$92.66 \pm 0.26^a$



### FOURIER TRANSFORM INFRARED SPECTROMETRY



## CONCLUSION

1. We reported a surface treatment method from hydrophilic to hydrophobic property of a drying chamber surface by commercial water repellent chemical (Rain-Z™)
2. Chemical used were significantly increased the spray dried product recovery and a constant recovery was achievable up to cycle 7
3. Both contact angle and SEM results showed that the chemical used was effectively increased the hydrophobicity of the glass.
4. FTIR result indicated a safe alternative method as no changes were occurred on both functional groups found in powdered sample of treated and untreated spray dryer drying chamber.

## ACKNOWLEDGEMENT

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