

Mixing and Temperature Control

Common Mixers for Tortillas

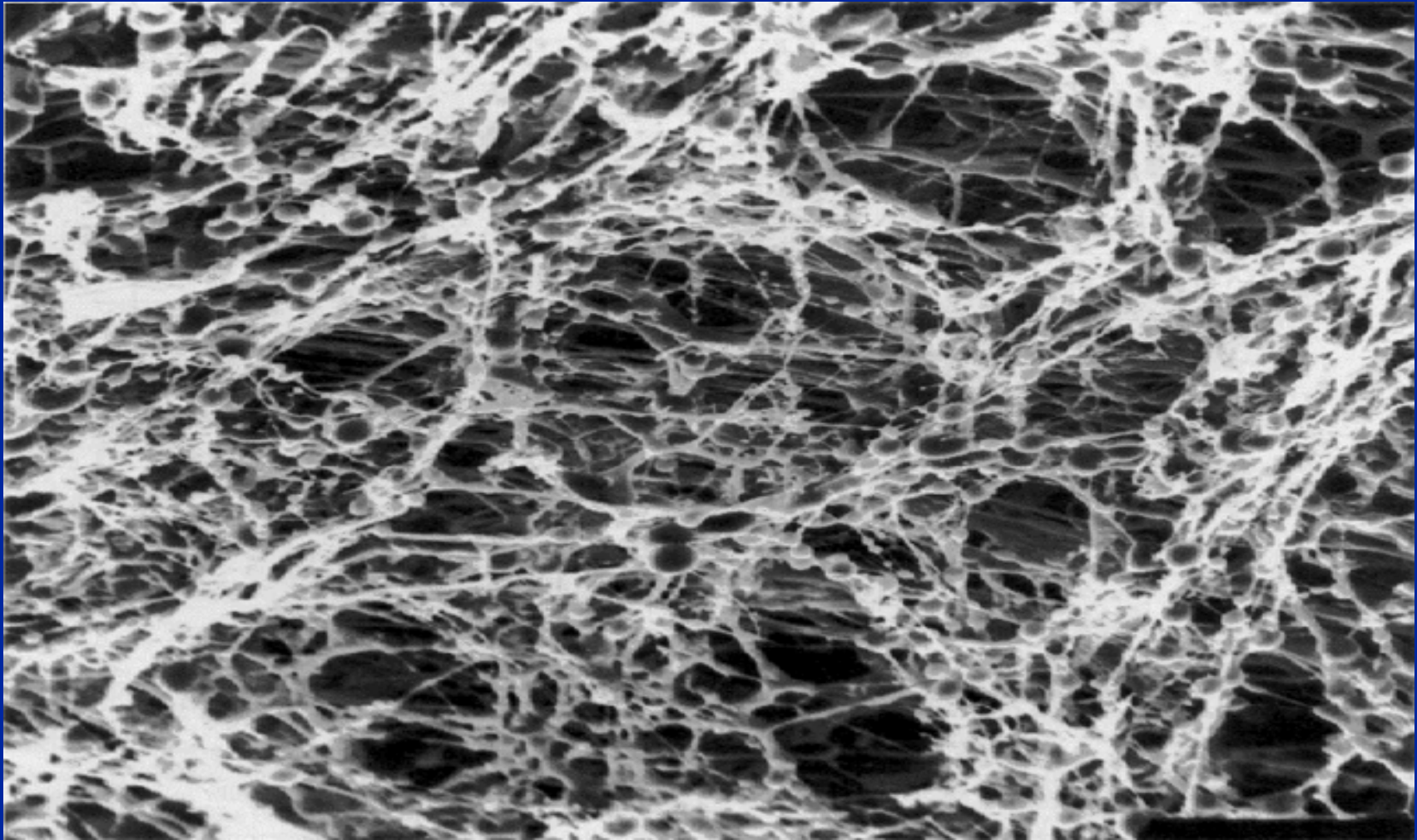
- Spiral mixer
- Vertical mixer
- Horizontal mixer



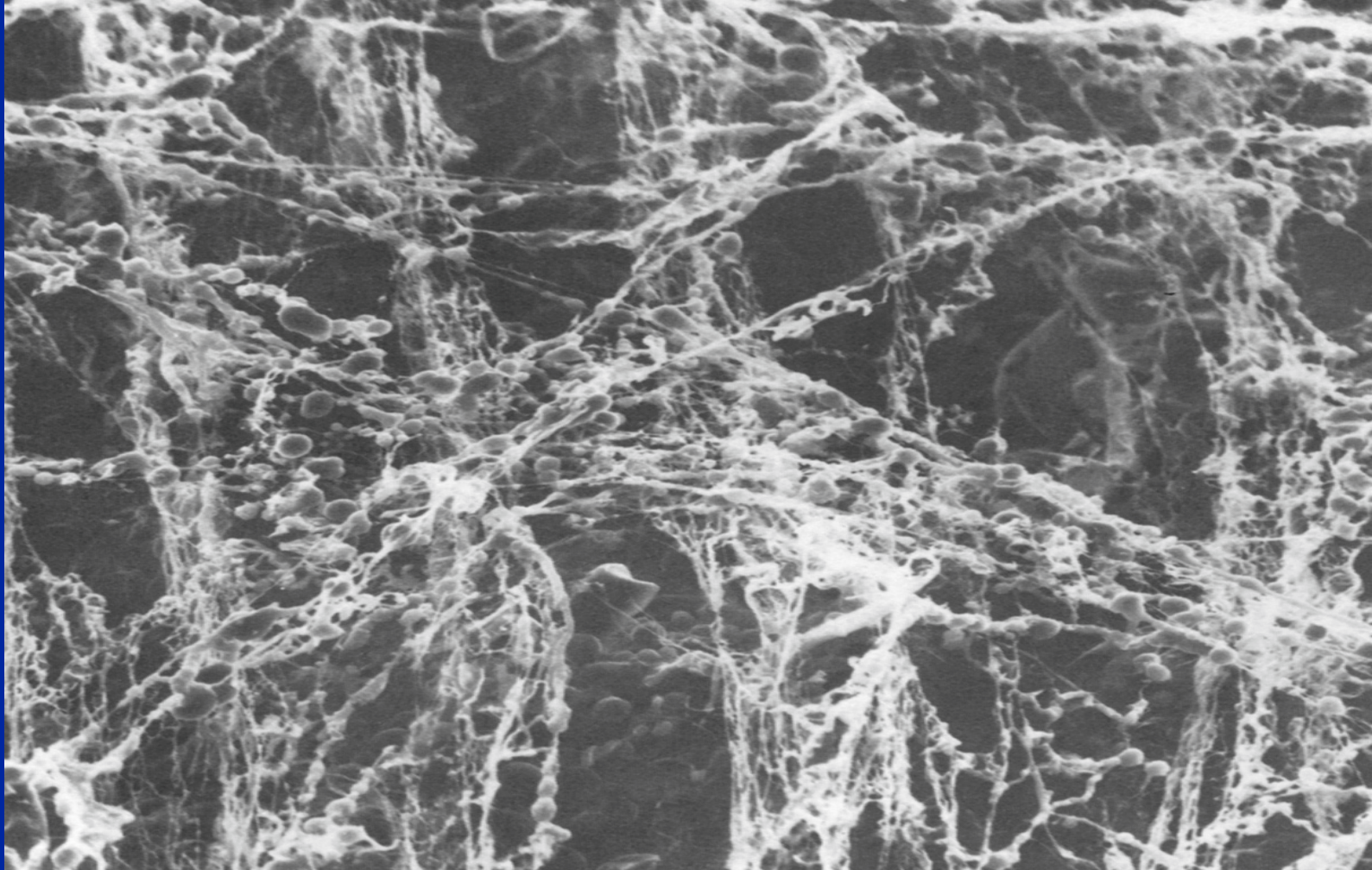
Mixing of Doughs: Objectives

- Uniformly incorporate ingredients
- Hydrate all dry materials completely
- Develop the gluten for proper handling quality and gas retention

Undeveloped Gluten



Developed Gluten



Factors Which Affect Mixing Time: **Machinery**

- Speed of mixer (RPM)
- Mixer design
- Dough size / mixer capacity
- Adequacy of refrigeration

Factors Which Affect Mixing Time:

Ingredients

- Flour (protein)
- Water absorption
- Amount of shortening
- Amount of soy protein
- Amount of reducing agents
- Amount of oxidizing agents

Why Is Temperature Control Important?

- Controls final product consistency
- Controls the rate of reaction in baking powders.
- Controls the consistency of the dough.
- Affects ingredients solubility.

Temperature Control

- **TEMPERATURE CHANGES THAT OCCUR DURING THE MIXING OF A DOUGH CAN BE ATTRIBUTABLE TO TWO PRINCIPLE CAUSES:**

1. HEAT GENERATED BY THE FRICTIONAL FORCES.

2. THE HEAT OF HYDRATION OF FLOUR.



Other Factors Affecting Temperature Control

- Temperature of ingredients.
- Size and type of mixing equipment.
- Batch size.
- Mixing procedures: time, speed, stages.
- Room temperature: summer, winter.

Ways to manage temperatures

- **Ingredient temperatures.**
- **Chilled water/ice water**
- **Mix times**
- **Mixer refrigeration**
- **CO2 chilling systems**

Friction Factor Calculation

Straight dough system formula:

$$FF = (3 \times A.D.T.) - (RT + FT + WT)$$

ADT (Actual dough temperature

FF (Friction factor) FT (Flour temp.)

RT (Room temp.) WT (Water temp.)

**Calculation of water temperature to
give desired dough temperature**

Straight Dough System

Cal H₂O Temp. =

$$\mathbf{(3 \times D.D.T.) - (RT + FT + FF)}$$

DDT (Desired dough temperature)

Calculation of Amount of Ice Needed to Give Desired Dough Temperature In Degrees Fahrenheit

Wt. of ice =

$$\frac{\text{Wt. of H}_2\text{O (Tap H}_2\text{O Temp. - Cal. H}_2\text{O Temp.)}}{\text{Tap H}_2\text{O Temp. + 112}}$$