**BAKING SODA VERSUS BAKING POWDER**

Baking soda and baking powder are two common ingredients in baked goods. Here we take a look at what these leavening agents are made of and how they help your cookies, muffins, and cakes rise.

### WHAT ARE RAISING AGENTS?

Carbon dioxide makes doughs and batters rise during baking. The gas can be produced by yeast, other microorganisms, or chemical raising agents.

### BAKING SODA

- **Sodium bicarbonate**
  - Chemical formula: \( \text{NaHCO}_3 \)
  - **Reaction:**
    - \( \text{NaHCO}_3 + \text{HX} \rightarrow \text{CO}_2 + \text{NaX} + \text{H}_2\text{O} \) (neutral salt)
    - \( 2\text{NaHCO}_3 \rightarrow \text{CO}_2 + \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} \)

- **Heat or acidity breaks down sodium bicarbonate to release carbon dioxide.** If a dough or batter is acidic enough, no acid needs to be added with the baking soda.
- **Baking soda is alkaline—too much causes bitter flavors in baked products.**
- **Potassium bicarbonate**
  - Used to reduce sodium content of baked goods.
- **Ammonium bicarbonate**
  - Produces carbon dioxide and ammonia gases. Used in crisp cookies and crackers.

### BAKING POWDER

- **Sodium bicarbonate**
  - **Acid or acidic salt**
  - **During mixing**
    - A soluble acid reacts with the baking soda.
  - **During baking**
    - A less soluble acid reacts with the baking soda.

### BAKING POWDER ACIDS

- **Cream of tartar (potassium bitartrate)** is a soluble acid and reacts during mixing.
- **Potassium bitartrate**
  - Chemical formula: \( \text{HOOC} \rightarrow \text{CO}_2 \rightarrow \text{K}^+ \)
- **Monocalcium phosphate**
  - Chemical formula: \( \frac{\text{Ca}^{2+}}{\text{O}^2-} \)
- **Sodium aluminum sulfate**
  - Chemical formula: \( \text{[Na}^{+} \text{Al}_2\text{O}_5\text{]}^{-} \)

Double-acting baking powders often combine monocalcium phosphate, which reacts with baking soda during mixing, with sodium aluminum sulfate, which reacts during baking. Some other baking powders use pyrophosphate salts, whose different granulations can vary their reaction times.