

AMMONIUM BICARBONATE — BICARBONATE APPLICATIONS



LEAVENING REACTION

Ammonium bicarbonate (ABC) is a preferred chemical leavening agent for baking many cookies and crackers. Its self-contained leavening action doesn't require a leavening acid. At room temperature, when dissolved in dough, batter or water, ammonium bicarbonate begins to dissociate and slowly release ammonia, carbon dioxide and water. However, when the temperature exceeds about 104°F (as in the early stages of baking) ammonium bicarbonate reacts rapidly according to the chemical equation:



The release and initial expansion of carbon dioxide gas throughout the dough produces a leavening action. As the baking temperature rises, ammonia gas is released, thus increasing the leavening effect.

Ammonium bicarbonate food grade has a specialized application as a leavening agent. When used without leavening acids, it is limited to small products with open cells, baked to a low moisture content (less than 5%) so the ammonia gas can bake out. Products in which it is

used include cookies where increased spread is desired, crackers, éclairs and puff shells. Ammonium bicarbonate in combination with a leavening acid can be used in higher moisture products such as snack cakes.

The special leavening action of ammonium bicarbonate contributes to several desirable characteristics in small, porous baked goods.

ESTABLISHES GRAIN AND STRUCTURE

Ammonium bicarbonate reacts early in the baking process of small or thin products to establish top grain and structure before the product sets during the latter stage of baking. It is used in cookies, crackers and similar products where the cellular structure is sufficiently porous to permit escape of the gases at the end of the baking process when the product is nearly dried out.

COMBINATION SYSTEMS

Ammonium bicarbonate is often used in combination with other chemical leavening systems (baking powder or baking soda) to release leavening gases both early and later in the baking process.



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In addition to this two stage release, ammonium bicarbonate increases the spread of cookie doughs, helping them to shape more uniformly. Baking powder or baking soda, used in combination with ammonium bicarbonate, will increase the height or crown of the cookie.

EFFECT ON PH

Ammonium bicarbonate can also be used as a processing aid. It increases pH of a dough during baking to effect browning while returning pH of the finished baked product to neutral as the ammonia escapes at the end of the baking process.

AMMONIUM BICARBONATE APPLICATIONS: BAKERY PRODUCTS LEAVENED WITH AMMONIUM BICARBONATE

Product	Function of Ammonium Bicarbonate
Sprayed butter crackers	Controls Color
Milk or graham crackers	Controls spread and thickness, hastens bake-out, darkens color
Semi-sweet products such as tea biscuits	Controls spread, height and top grain
Rotary molded cookie products such as plain, sugar, base cakes, marshmallow, cream-filled sandwiches, etc.	Controls spread, height and top grain
Wire-cut cookie products such as chocolate chip, molasses, etc.	Controls spread, darkens color
Bars (chewy type)	Controls spread, darkens color
Eclairs and puff shells	Very open, large cell structure
Pretzels (hard, crispy types)	Improves texture

Figure 1.

AMMONIUM BICARBONATE APPLICATIONS: LEAVENING OF COOKIES AND CRACKERS, BY TYPE OF PRODUCT

	Soda & Saltine Crackers	Sprayed Butter Crackers	Semi-Sweet Products (Tea Biscuits)	Rotary Molded: Shortcake, Creme-Filled, Sandwich	Wire-Cut Products: Choc. Chip, etc.	Deposited Products: Butter Cookies
ABC %	0	1-3	0.25-1.5	0.25-0.75	0.15-0.75	0
Finished Product Moisture %	2	2	2-2.5	2-3	3-5	3-4
Other Leaveners	SBC, KBC, Yeast	SBC, KBC, MCP	SBC, KBC, SAPP	SBC, KBC, SAPP	SBC, KBC	SBC, KBC
Finished Product pH	7.6-7.8	7.4	7.1	7.2	7.2-8.0	7.2

Figure 2.