



Analyzing the quality of baked products via spectrophotometric color measurement is essential to ensuring consumer satisfaction.

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One of the best parts of my morning is walking into my local bakery and smelling the aroma of the freshly baked breads, cakes, and cookies, all right out of the oven and ready to entice the day's customers. When buying bagged or boxed baked goods at the grocery store, however, there are no scent cues to guide my purchasing decisions. Instead, I must rely solely on sight to assess whether or not a product looks tasty.

Luckily, the color of baked foods can tell you a lot, giving you vital clues about potential flavor and even texture based on hue alone. Chances are you'll pass over the cookies that just a bit too darkened, but you'll reach for ones with just the right amount of browning, believing they'll taste just right. Food manufacturers know this and are deeply aware of the impact the look of their products has on consumer choice. Thus, instrumental color measurement is an essential part of analyzing the quality of baked products for food manufacturers around the world.



The color of baked goods is the product of Maillard reactions, a complex series of chemical reactions that give cookies, breads, and cakes their distinctive color, smell, and taste.

Image Source: Pexels user Padurariu Alexandru

#### The Impact of the Maillard Reaction

The color of baked goods depends on both their ingredients and their processing and the ideal color varies from product to product; a flour tortilla will look very different than a corn tortilla and a light rye bread is immediately distinct from a dark rye. But regardless of the specifics of any one item, what they all share is the Maillard reaction.

The Maillard reaction the result of complex chemical interactions between amino acids and reducing sugars in the presence of increased temperatures. The most obvious result of Maillard is browning, but it also produces distinct and desirable flavors. As *Food Info* notes, "In the process, hundreds of different flavour compounds are created. These compounds, in turn, break down to form yet more new flavour compounds, and so on. Each type of food has a very distinctive set of flavour compounds that are formed during the Maillard reaction."<sup>1</sup> The Maillard reaction, then, is not a single phenomena, but a highly individualized process that results in unique colors, flavors, and odors, creating a multi-sensory experience that deeply impacts the way we see, smell, and, ultimately, taste food.

#### Color As an Indicator of Quality

Food color is of extraordinary importance; research has shown again and again that consumers make purchasing decisions primarily based on visual information, and creating attractive products is essential to the success of all types of food products. However, in baked goods, color does not exist in isolation but acts as a visual signal; because the quality parameters affected by the Maillard reaction work as a network, it is possible to make educated guesses about all sensory variables based on a single variable. Thus, measuring color is a reliable method of analyzing the quality of baked goods in a non-destructive manner.

<https://youtu.be/EJKZUTfeuaQ>

### Choosing the Right Instrument

Reflectance spectrophotometers are ideally suited to measuring the color of baked goods due to their ability to objectively quantify chromatic information and translate it into applicable colorspaces and indexes. But all spectrophotometers are not created equal. As Rachel Stothard notes, because baked goods are “made of ingredients that can vary in colour and appearance themselves, it is impossible to get the finished product to be completely uniform in colour from batch to batch.”<sup>2</sup> As such, [sample averaging offers a more reliable representation of the product](#). Selecting a spectrophotometer capable of rapidly capturing and averaging multiple measurements is essential to producing accurate results. It is also important to remember that while many spectrophotometers can adequately handle uniform samples, baked goods are rarely flat or smooth. As such, using a spectrophotometer with [integrated height measurement](#) that can automatically account for texture variations is necessary for true precision.

### Creating a Color System

Because the individualized nature of Maillard reactions means that different types of baked goods will have different ideal appearances, food manufacturers must develop a [color system unique to each product type](#). Combining your spectrophotometer with [a sophisticated software package](#) allows you to easily create color standards that can be used throughout production to ensure that products stay within your chosen tolerance range. When a product falls out of spec, operators will be alerted instantly, providing the opportunity to take corrective action and prevent the release of defective product into the marketplace, enhancing efficiency and protecting your reputation for quality.

### HunterLab Instrumentation

HunterLab has been a pioneer in the field of spectrophotometry for over 60 years. Today, we offer a comprehensive range of [portable, benchtop, and inline instruments](#) that let you measure color in virtually any situation, from spot checking in the laboratory to continuous monitoring in the production line. Our commitment to innovation and technological excellence has made us a leading name in color measurement within the food industry, which is why top producers of baked goods such as Kraft, Entemans, Keebler, and General Mills rely on HunterLab for unprecedented color quality control. [Contact us](#) for more information about our dynamic lineup of spectrophotometers, customizable software packages, and superior customer service.

1. “Maillard Reactions,” August 14, 2014, <http://www.food-info.net/uk/colour/maillard.htm>
2. “How to Measure the Quality of Baked Goods,” July 16, 2014, <http://www.colourmeasure.com/knowledge-base/2015-07-16-how-to-measure-the-quality-of-baked-goods>