



## Caramel Color 101

By David L. Tuescher  
Contributing Editor

**C**aramel color is used worldwide in everything from beverages to sauces to cookies. However, confusion often results the first time an R&D person considers using caramel color; Although a wide range of products are available, every liquid caramel color looks the same on the shelf.

### Rainbow of choices

An extensive line of caramel color is produced to suit a wide spectrum of food and beverage applications. Some are specifically used in alcohol concentrations up to 90%, for example, while others work best in high-salt concentrations, such as soy sauce. Caramel color ranges from light-yellow to reddish, and dark-brown hues—even one that is similar in color to dark cocoa. The first step in picking a proper caramel color is developing a basic understanding.

Caramel color is generally recognized as safe (GRAS) as a general-purpose food additive (Title 21 of the *Code of Federal Regulations (CFR)*, Part 182, Section 1235), and it is exempt from certification for use as a color additive (21 *CFR* Pt. 73.85). FDA defines it as “the dark-brown liquid or solid material resulting from the carefully controlled heat treatment of the following food-grade carbohydrates: dextrose; invert sugar; lactose; malt sirup (syrup); molasses; starch hydrolysates and fractions thereof; and sucrose.” The most commonly used carbohydrate to produce caramel color is high dextrose corn syrup.

The Food Chemicals Codex defines caramel color and lists the carbohydrates, acids, bases and salts allowed in its manufacture. It also lists the four classes of caramel color:

**Class I (Plain Caramel).** Prepared by heating carbohydrates with or without acids or alkalies; no ammonium or sulfite compounds are used.

**Class II (Caustic Sulfite Caramel).** Prepared by heating carbohydrates with or without acids or alkalies in the presence of sulfite compounds; no ammonium compounds are used.

**Class III (Ammonia Caramel).** Prepared by heating carbohydrates with or without acids or alkalies in the presence of ammonium compounds; no sulfite compounds are used.

**Class IV (Sulfite Ammonia Caramel).** Prepared by heating carbohydrates with or without acids or alkalies in the presence of both sulfite and ammonium compounds.


Each class of caramel color has specific characteristics based on the reactants used: Class I caramel colors have a neutral ionic charge; Class II are very negative; Class III are strongly positive; and Class IV are strongly negative. The ionic charge is important. If a positive caramel is mixed in a solution with a product containing negative ions, they will attract each other and produce a haze, or even precipitate. For example, coffee’s negative ions, plus a Class III caramel has this effect, so Class IV or Class I are best.

## Caramel color qualities

The basic laboratory data for caramel colors consists of four characteristics: color, Baume, hue, and pH. Color strength is measured as tinctorial power (absorbance at 560 nm of a 0.1% solution in a 1 cm cell), or color intensity (the same solution at 610 nm). The pH is measured on an as-is basis and requires five or more minutes for the probe to equilibrate due to the high solids content. Baume, or specific gravity, is a measure of the solids content, and is usually done with a density spindle or the newer electronic densitometers. The final parameter is hue (Hue Index), which measures of the degree of redness. Typically, Class I caramel colors are the reddest and have a higher index, followed by Class III. Class IV caramel colors have the lowest hue, and are the least red. There are many more tests like salt and alcohol solubility, but these are more dependent on the designed use of the product.

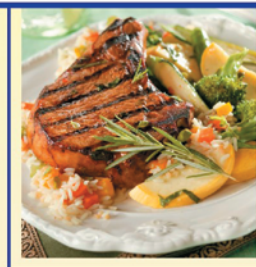
All caramel colors are water soluble. However, they can be dispersed in oil, but this often requires emulsifiers, such as lecithin, resulting in pastes or emulsions.

Caramel colors change with age. When they are manufactured, the carbohydrate and chemicals are heated to a high temperature (often under pressure) to form large polymers that generate the color. When the desired color end point is reached, the reaction mass is cooled to stop the reactions. In reality, the reactions never stop, they simply slow down. So, as the product ages, the pH decreases while the color strength and viscosity increase. The biggest change is often viscosity. However, a modern caramel color is shelf stable for two years or more, but as it ages it thickens. Using fresh samples will ensure a sample represents the product sold.

Contact your supplier to ask questions, get in the lab and experiment, and don't be afraid to try something different. Customers have done things we would never advise, and they were delighted with the outcome—there is always more to be learned. 

David Tuescher is technical director at Sethness Products Company, Clinton, IA. Sethness has been producing caramel color since 1880, and currently offers over 60 different liquids and 20 powders. The company has developed a Caramel Color 101 presentation, providing a basic introduction to the world of caramel color that goes into depth discussing specific applications. For more information, e-mail [lab@sethness.com](mailto:lab@sethness.com).

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