

## Why Does Your Coffee Taste and Smell Delicious?

The major difference between coffee roasts comes from the chemical reactions that occur in the coffee beans at certain temperatures. As a result of these chemical reactions, aromatics, acids and other flavor components are created, balanced or altered in a way to build the perfect flavor, acidity, aftertaste and body of coffee.

### 1. Maillard Reaction

A key reaction for the development of roasted coffee flavor and color is the Maillard reaction. At temperatures from 150-200°C, carbonyl groups (from sugars) and amino groups in proteins react to form aroma and flavor compounds. Hundreds of coffee flavor compounds are formed from Maillard chemistry, including the potent coffee aroma flavor compound, 2-furfurylthiol.

### 2. Caramelization

From 170-200°C the sugars in coffee start caramelizing, which browns the sugar and releases aromatic and acidic compounds. During roasting, most of the sucrose is converted to caramelized compounds, but if you roast the coffee too lightly, the bitter tasting compounds won't degrade.

### 3. First Crack

Around 205°C water inside the bean vaporizes, causing the bean to expand and crack (both physically and audibly). This first crack makes the bean double in size. Prior to first crack, the bean changes from a green/yellow color to a light brown color. At this point, the bean loses about 5% of its weight from water loss. Light roasts are done after this step.

### 4. Pyrolysis

At approximately 220°C, the heat causes a chemical change inside the bean, leading to the release of carbon dioxide. This process is called pyrolysis. The color changes to a medium brown and the bean loses 13% of its weight.

### 5. Second Crack

Pyrolysis continues as temperatures reach 225-230°C, causing the second crack in the bean. That second crack is the cellulose in the cell wall of the bean breaking apart. The bean is now medium-dark brown in color and has an oily sheen. It's during this step where the aromatic compounds are released, contributing to coffee's classic flavor.

#### Sources:

<http://www.coffeeresearch.org/coffee/roasting.htm>

<https://www.sweetmarias.com/roast.carlstaub.html>