

chemistry in cooking

Chemistry in Cooking: Unlocking the Science Behind Every Bite

chemistry in cooking is a fascinating blend of science and art that takes place every time you step into the kitchen. Whether you're whipping up a simple omelet or baking a complex soufflé, countless chemical reactions are occurring that transform raw ingredients into delicious dishes. Understanding these reactions not only satisfies curiosity but can also elevate your culinary skills, enabling you to manipulate flavors, textures, and aromas with greater precision.

Exploring the chemistry behind cooking reveals why certain techniques work and how ingredients interact on a molecular level. From caramelization to emulsification, the invisible science that powers your stove is what makes cooking both an experiment and a form of expression. Let's dive into some of the most interesting chemical processes that make cooking an enchanting experience.

The Role of Heat: Transformations Through Temperature

Heat is arguably the most crucial element in cooking chemistry. When heat is applied to food, it triggers a variety of molecular changes that affect flavor, texture, and safety.

Maillard Reaction: The Flavor Booster

One of the most celebrated chemical reactions in cooking is the Maillard reaction. This process occurs when amino acids and reducing sugars react at high temperatures, usually above 285°F (140°C). It is responsible for the golden-brown crust on grilled steaks, toasted bread, and roasted coffee beans. The Maillard reaction creates hundreds of new flavor compounds, contributing to the complex, savory notes we love.

Interestingly, this reaction is sensitive to pH and moisture levels. For example, marinating meat in a slightly alkaline solution can accelerate browning, while too much moisture can inhibit it. Understanding this can help you perfect the sear on your meats or the toastiness of your baked goods.

Caramelization: Sweet Science

Caramelization is another heat-induced chemical change, but it involves the breakdown of sugars rather than proteins. When sugar is heated beyond its melting point (around 320°F or 160°C), it begins to decompose and form rich, nutty, and sweet flavors along with a characteristic brown color. This reaction is essential in candy-making, caramel sauces, and even in browning onions.

Unlike the Maillard reaction, caramelization doesn't require amino acids. However, controlling the temperature is key since burning sugar leads to bitterness. Mastering this process can turn simple ingredients into luxurious desserts or deeply flavored savory dishes.

Acids and Bases: The pH Impact on Cooking

The acidity or alkalinity of food, measured by pH, affects how ingredients behave chemically. Adjusting pH can change textures, colors, and even nutritional content.

Tenderizing Meat with Acids

Marinating meat in acidic liquids like lemon juice, vinegar, or wine is a classic example of chemistry in cooking. The acid partially breaks down muscle fibers and connective tissues, making the meat more tender and flavorful. However, prolonged exposure can over-tenderize and make the meat mushy, so timing is essential.

Color Changes in Vegetables

The vibrant colors of vegetables are often due to natural pigments like anthocyanins and chlorophyll, which react to pH changes. For instance, red cabbage turns bright purple in neutral solutions, red in acidic, and greenish-yellow in alkaline environments. Cooking vegetables in acidic or basic solutions can dramatically alter their appearance and taste.

Emulsification: Blending the Unblendable

Emulsification is a key chemistry concept in cooking that involves mixing two immiscible liquids, usually oil and water, into a stable mixture. This is fundamental for making dressings, sauces, and spreads.

How Emulsifiers Work

Emulsifiers, like lecithin in egg yolks or mustard in vinaigrettes, have molecules with both hydrophilic (water-attracting) and hydrophobic (oil-attracting) ends. They surround tiny droplets of oil, preventing them from coalescing and separating. This stabilizes the mixture and creates smooth textures.

Tips for Perfect Emulsions

- Slowly add oil while continuously whisking or blending to create small droplets.
- Use fresh emulsifiers like egg yolks or mustard for better stability.
- Avoid overheating, as temperature can break emulsions.

Mastering emulsification can elevate your homemade mayonnaise, hollandaise sauce, and salad dressings.

Fermentation: Harnessing Microbial Chemistry

Fermentation is a natural chemical process driven by microorganisms like bacteria, yeast, and molds. It's responsible for creating a wide range of foods with unique flavors and textures.

The Science Behind Fermentation

During fermentation, microbes consume sugars and convert them into acids, gases, or alcohol. For example, lactic acid bacteria ferment lactose in milk to produce yogurt, giving it a tangy flavor and creamy texture. Yeast ferments sugars in dough to produce carbon dioxide, which makes bread rise.

Fermentation not only enhances taste but also preserves food and can increase its nutritional value by producing beneficial enzymes and vitamins.

Practical Applications

- Making sourdough bread involves wild yeast and bacteria creating organic acids that give it a distinct flavor.
- Kimchi and sauerkraut are fermented vegetables rich in probiotics.
- Alcoholic beverages like beer and wine rely on fermentation for alcohol production.

Understanding fermentation helps you appreciate the complexity behind these beloved foods and can inspire you to experiment with homemade ferments.

Proteins in Cooking: Denaturation and Coagulation

Proteins are essential building blocks in many foods and undergo significant chemical changes during cooking.

Denaturation: Unfolding the Protein Structure

Denaturation refers to the alteration of a protein's natural structure due to heat, acid, or mechanical action. When you cook an egg, the clear egg whites turn opaque and firm because the heat breaks the weak bonds holding the protein strands in their native shape.

Coagulation: Forming Solid Structures

Following denaturation, proteins can coagulate, meaning they bond together to form a solid or semi-solid mass. This process is crucial in creating textures in custards, cheeses, and cooked meats. The temperature and timing during cooking can drastically affect the firmness and juiciness of protein-rich foods.

Water's Crucial Role: Solvent and Heat Carrier

Water is often underestimated, but it plays a central role in the chemistry of cooking. It acts as a solvent, dissolving salts, sugars, and other molecules, and as a heat carrier, distributing temperature evenly.

Boiling and Steaming

When boiling vegetables or pasta, water's high heat capacity ensures even cooking. Steaming allows gentle cooking, preserving nutrients and texture. The temperature of boiling water (212°F or 100°C at sea level) sets a limit on cooking temperature, which is why pressure cookers are used to reach higher temperatures and speed up cooking.

Water Activity and Food Preservation

Water activity (a_w) measures the availability of water for microbial growth. Reducing water activity by drying or adding salt/sugar inhibits bacteria, preserving food. This principle is behind curing meats and making jams.

Leavening Agents: The Science of Rising

Leavening agents create gas bubbles in dough or batter, causing it to rise and become light and fluffy.

Chemical Leavening

Baking soda (sodium bicarbonate) and baking powder undergo chemical reactions when exposed to moisture and heat, producing carbon dioxide gas. This gas expands in the batter, creating air pockets. The balance of acidic and alkaline ingredients is important to ensure proper leavening without off-flavors.

Biological Leavening

Yeast fermentation produces carbon dioxide as well, but more slowly, resulting in different textures and flavors, as seen in bread and pizza dough.

Enhancing Flavor Through Chemical Understanding

Knowing the chemical basis of cooking allows you to manipulate flavors more effectively. For example, salt doesn't just add saltiness; it can suppress bitterness and enhance sweetness. Similarly, acids can brighten flavors and balance richness.

Adding umami-rich ingredients like soy sauce or mushrooms introduces glutamates that stimulate taste receptors, deepening savory notes. Toasting spices triggers chemical changes that release essential oils and intensify aroma.

Experimenting with these elements while keeping chemistry in mind can turn your cooking into a more rewarding and creative process.

Cooking is more than following recipes; it's applying the principles of chemistry in cooking to transform ordinary ingredients into extraordinary meals. By understanding the science behind heat, acids, proteins, and microbial action, you can unlock new culinary possibilities and enjoy the magic of food at a whole new level.

Frequently Asked Questions

How does the Maillard reaction enhance the flavor of cooked food?

The Maillard reaction is a chemical reaction between amino acids and reducing sugars that occurs when food is heated, producing complex flavor compounds and browning. This reaction enhances the taste and aroma of cooked foods like grilled meat and toasted bread.

What role does acidity play in cooking and food preservation?

Acidity affects the texture, flavor, and preservation of food. In cooking, acidic ingredients like lemon juice or vinegar can denature proteins, tenderizing meats or altering textures. In preservation, acidity inhibits microbial growth, extending shelf life in pickling and fermenting processes.

Why does adding salt improve the flavor and texture of food?

Salt enhances flavor by suppressing bitterness and enhancing sweetness and umami. Chemically, it affects protein structure, helping to retain moisture and improve texture in meats and baked goods. Salt also influences yeast activity in bread making, impacting dough fermentation.

How does emulsification work in cooking sauces like mayonnaise?

Emulsification is the process of mixing two immiscible liquids, such as oil and water, into a stable mixture. In mayonnaise, lecithin in egg yolks acts as an emulsifier, allowing oil droplets to disperse evenly in vinegar or lemon juice, creating a smooth and creamy sauce.

What chemical changes occur during caramelization in cooking?

Caramelization is the thermal decomposition of sugars when heated above 120°C, leading to the formation of brown pigments and complex flavor compounds. This process adds sweetness, color, and rich flavors to foods like caramel, roasted vegetables, and baked goods.

Additional Resources

Chemistry in Cooking: Unlocking the Science Behind Culinary Art

chemistry in cooking forms the invisible yet fundamental backbone of culinary practices, bridging the gap between raw ingredients and delectable dishes. Understanding the chemical reactions that occur during food preparation not only enhances the cooking process but also empowers chefs and home cooks to innovate and optimize flavors, textures, and nutritional value. This article delves into the nuanced role of chemistry in cooking, exploring how molecular transformations contribute to the sensory appeal and safety of food.

The Role of Chemistry in Culinary Transformations

At its core, cooking is a series of chemical reactions triggered by heat, moisture, and the interaction of various ingredients. These reactions alter the physical and chemical properties of food components, resulting in changes that are perceptible to the senses. From the caramelization of sugars to the denaturation of proteins, the science behind cooking is as complex as it is fascinating.

Chemistry in cooking explains why bread rises, why meat browns, and how emulsions hold together. Each culinary technique applies specific conditions that influence molecular behavior, thereby shaping the final dish. For instance, baking involves Maillard reactions, which are responsible for the characteristic flavor and brown crust of baked goods. Similarly, the coagulation of egg proteins during boiling or frying is a chemical change that solidifies texture.

Key Chemical Reactions in Cooking

Several chemical processes underpin the transformation of ingredients during cooking:

- **Maillard Reaction:** A complex series of reactions between amino acids and reducing sugars that occur at elevated temperatures, producing browned color and rich flavors in grilled meats, baked bread, and roasted coffee.
- **Caramelization:** The thermal decomposition of sugars resulting in a sweet, nutty flavor and brown color, commonly observed in caramel sauces and roasted vegetables.
- **Denaturation and Coagulation:** Heat, acid, or mechanical action causes proteins to unfold (denature) and then aggregate (coagulate), a process critical in cooking eggs, meat, and dairy products.
- **Fermentation:** Biochemical breakdown of carbohydrates by microorganisms, producing acids, gases, or alcohol, essential in bread leavening, yogurt production, and pickling.

These reactions are influenced by variables such as temperature, pH, moisture content, and ingredient composition, highlighting the precision required to achieve desired culinary outcomes.

Impact of Chemistry on Flavor Development

Flavor perception is central to cooking, and chemistry in cooking plays a vital role in

developing complex taste profiles. The interaction of volatile compounds formed during chemical reactions stimulates olfactory receptors, while non-volatile substances affect taste receptors on the tongue.

For example, during roasting, the Maillard reaction generates hundreds of flavor compounds that contribute to the savory, umami-rich notes in cooked meat. On the other hand, caramelization imparts sweet and slightly bitter flavors that enhance desserts and sauces. The manipulation of pH levels also alters flavor perception; adding acidic ingredients like lemon juice can brighten flavors, while alkaline conditions can mellow bitterness.

Moreover, the breakdown of starches into simpler sugars during cooking increases sweetness, while the release of amino acids enhances umami taste. Understanding these chemical processes allows chefs to balance flavors more effectively and create harmonious dishes.

Texture and Chemistry Interplay

Texture is another sensory attribute profoundly affected by chemistry in cooking. The structural modification of food components—mainly proteins and carbohydrates—determines whether a dish feels tender, crispy, creamy, or chewy.

For example, gelatinization of starches occurs when starch granules absorb water and swell upon heating, thickening sauces and custards. In contrast, collagen in connective tissues breaks down into gelatin during slow cooking, tenderizing meat. The emulsion of fat and water, stabilized chemically by emulsifiers like lecithin, creates smooth textures in mayonnaise and hollandaise sauce.

Chemical agents such as acids and salts also influence texture; marinating meat in acidic solutions can denature proteins, softening the meat, while salt can strengthen gluten networks in bread dough, affecting chewiness.

Nutrition and Safety: Chemical Considerations

Beyond sensory attributes, chemistry in cooking significantly impacts the nutritional quality and safety of food. Thermal processing can both enhance and diminish nutrient availability. For instance, cooking increases the bioavailability of certain antioxidants in tomatoes, yet excessive heat may degrade vitamin C.

Chemical reactions can also detoxify harmful compounds or conversely generate undesirable substances. For example, fermentation reduces antinutritional factors like phytic acid in grains, improving mineral absorption. However, high-temperature cooking methods like frying can produce acrylamide, a potential carcinogen formed from sugars and amino acids.

Food safety relies heavily on chemical principles. Proper cooking temperatures denature harmful enzymes and kill pathogens through irreversible protein denaturation and

membrane disruption. pH adjustments through acidification can inhibit microbial growth in pickled and fermented foods, demonstrating the practical application of chemistry for safe preservation.

Innovations in Culinary Chemistry

The intersection of chemistry and cooking has given rise to the field of molecular gastronomy, where chefs employ scientific techniques to create novel textures, flavors, and presentations. This discipline utilizes chemical knowledge to manipulate ingredients at the molecular level, often incorporating tools like liquid nitrogen, emulsifiers, and hydrocolloids.

For example, spherification, a process that uses calcium ions to gel alginate solutions, creates spheres with liquid centers, mimicking caviar. Sous-vide cooking, which involves vacuum-sealing food and cooking it at precise low temperatures, relies on chemical kinetics to optimize texture and flavor without overcooking.

These innovations exemplify how a deeper understanding of cooking chemistry can push the boundaries of traditional culinary arts.

Practical Applications for Home Cooks and Professionals

Embracing the chemistry in cooking equips both amateur and professional cooks with the ability to troubleshoot and refine recipes. Recognizing why certain reactions occur can prevent common culinary pitfalls such as curdled sauces, tough meat, or bland flavors.

For instance, knowing that acid denatures proteins explains why adding lemon juice too early in cooking can result in a tougher texture. Understanding the temperature thresholds for Maillard reactions guides the choice of cooking methods to develop desired browning without burning.

Moreover, awareness of ingredient interactions supports healthier cooking choices, such as selecting cooking methods that preserve nutrients or reduce harmful compound formation.

- Adjust cooking times and temperatures to optimize Maillard and caramelization reactions without overcooking.
- Utilize acids and salts strategically to enhance flavor and texture through protein denaturation and gluten development.
- Incorporate fermentation to improve food preservation, flavor complexity, and nutritional value.
- Apply molecular gastronomy techniques to innovate and elevate presentation and sensory experience.

In essence, the practical application of chemistry principles transforms cooking from a routine task into a precise, creative science.

Exploring chemistry in cooking reveals the intricate dance of molecules that shapes every meal, underscoring the chef's role as both artist and scientist. With ongoing research and technological advances, the culinary landscape continues to evolve, promising new tastes, textures, and techniques grounded in the fundamental science of food.

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chemistry in cooking: The Science of Cooking Joseph J. Provost, Keri L. Colabroy, Brenda S. Kelly, Mark A. Wallert, 2016-04-29 Written as a textbook with an online laboratory manual for students and adopting faculties, this work is intended for non-science majors / liberal studies science courses and will cover a range of scientific principles of food, cooking and the science of taste and smell. Chapters include: The Science of Food and Nutrition of Macromolecules; Science of Taste and Smell; Milk, Cream, and Ice Cream, Metabolism and Fermentation; Cheese, Yogurt, and Sour Cream; Browning; Fruits and Vegetables; Meat, Fish, and Eggs; Dough, Cakes, and Pastry; Chilies, Herbs, and Spices; Beer and Wine; and Chocolate, Candy and Other Treats. Each chapters begins with biological, chemical, and /or physical principles underlying food topics, and a discussion of what is happening at the molecular level. This unique approach is unique should be attractive to chemistry, biology or biochemistry departments looking for a new way to bring students into their classroom. There are no pre-requisites for the course and the work is appropriate for all college levels and majors.

chemistry in cooking: Kitchen Chemistry Andrea Debbink, 2021-04-29 Do you dream of being an artist, chef, or scientist? Did you know that in the kitchen, you can be all three at once? The kitchen is a place where art meets science. Most food science uses chemistry -- so once you understand a little chemistry, you'll be a better cook! This book features more than 30 delicious recipes; a fill-in-the-blank logbook to rate and review the recipes; and stories about chefs, inventors, and more.

chemistry in cooking: Food Tom P. Coultate, 2009 As a source of detailed information on the chemistry of food this book is without equal. With a Foreword written by Heston Blumenthal the book investigates food components which are present in large amounts (carbohydrates, fats, proteins, minerals and water) and also those that occur in smaller amounts (colours, flavours, vitamins and preservatives). Food borne toxins, allergens, pesticide residues and other undesirables are also given detailed consideration. Attention is drawn to the nutritional and health significance of food components. This classic text has been extensively rewritten for its 5th edition to bring it right up to date and many new topics have been introduced. Features include: Special Topics section at

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chemistry in cooking: Chemistry of Cooking and Cleaning Ellen Henrietta Swallow Richards, 2008-07 Ellen Richards' 1882 The Chemistry of Cooking and Cleaning presents applied science in a simple fashion to the average reader. Through her work, householders can learn about the chemical processes behind common household matters such as the raising of bread, the process by which baking soda works, nutrition, and cleaning products.

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the trade secrets of commercial food manufacturers. Only instead of using bottles of chemicals, here this is accomplished using only natural foods, ordinary kitchen equipment and a brilliant novel technique. There is also an extensive glossary of terms relating to beers and wines at the back of the book. If you are an aspiring chef, you absolutely need this book. Understanding food chemistry has never been more important than in this age of molecular gastronomy. This isn't just dry theory. You will be able to make use of these methods in any commercial or home kitchen immediately.

chemistry in cooking: *What's Cooking in Chemistry?* Hubertus P. Bell, Tim Feuerstein, Carlos E. Güntner, Sören Hölsken, Jan Klaas Lohmann, 2011-12-07 Sie suchen den geeigneten Arbeitskreis für Ihren Postdoc-Aufenthalt? Oder suchen das optimale Geschenk für Ihre Freunde, die Chemiker sind? Vielleicht kochen Sie einfach gerne und suchen neue Rezepte? Ja? Dann ist dieses Buch für Sie gemacht! Dieses erste Who is Who der Organischen Chemie zeigt eindeutig, dass berühmte Wissenschaftler nicht nur im Labor, sondern auch am Herd in der Küche gerne und exzellent kochen. Servieren Sie beispielsweise einfache Köstlichkeiten wie Fisch mit Pommes a la K. C. Nicolaou. Mehr als 50 Lieblingsrezepte verschiedener Schwierigkeitsgrade berühmter Organiker wie Einsame Suppe (Evans), Toskanisches Wildschwein (Waldmann) oder Dulce de Leche (Vollhardt), ihre Biographien und ihre ausführlich recherchierten Forschungsinteressen finden Sie in dieser unterhaltsamen und informativen Zusammenstellung. Eine exquisite Delikatesse für jeden, der gerne kocht, gerne gut ißt und die Chemie liebt.

chemistry in cooking: *The Chemistry of Cooking and Cleaning. A Manual for Housekeepers* Ellen Henrietta Richards, 2024-05-30 Reprint of the original, first published in 1882.

chemistry in cooking: Food Tom P Coultate, 2016-01-13 First published in 1984, and now in its 6th edition, this book has become the classic text on food chemistry around the world. The bulk components – carbohydrates, proteins, fats, minerals and water, and the trace components – colours, flavours, vitamins and preservatives, as well as food-borne toxins, allergens, pesticide residues and other undesirables all receive detailed consideration. Besides being extensively rewritten and updated a new chapter on enzymes has been included. At every stage attention is drawn to the links between the chemical components of food and their health and nutritional significance. Features include: Special Topics section at the end of each chapter for specialist readers and advanced students; an exhaustive index and the structural formulae of over 500 food components; comprehensive listings of recent, relevant review articles and recommended books for further reading; frequent references to wider issues eg the evolutionary significance of lactose intolerance, fava bean consumption in relation to malaria and the legislative status of food additives around the world. Food: The Chemistry of its Components will be of particular interest to students and teachers of food science, nutrition and applied chemistry in universities, colleges and schools. Its accessible style ensures that it will be invaluable to anyone with an interest in food issues.

chemistry in cooking: *The Science of Cooking* Joseph J. Provost, Keri L. Colabroy, Brenda S. Kelly, Ashley L. Corrigan Steffey, Mark A. Wallert, 2025-04-03 PROVIDES A CLEAR AND ACCESSIBLE PATH TO LEARNING KEY SCIENTIFIC CONCEPTS THROUGH THE LENS OF FOOD AND COOKING The Science of Cooking provides an engaging and relatable way to explore the science behind every meal. Designed for both science and non-science majors, this popular textbook breaks down complex, molecular-level processes into easily digestible concepts. More than 30 inquiry-driven activities covering science basics and food-focused topics are supported by a series of experiments that can be conducted in the lab, in the classroom, and at home with minimal equipment. Now in its second edition, The Science of Cooking offers enhanced learning tools throughout, including new end-of-chapter questions, practice problems, and hands-on cooking labs. An entirely new "Science for the Chef" section pairing real-world recipes with scientific explanations is accompanied by new chapters on foundational chemistry and biochemistry that connect theory to practical cooking skills. The Science of Cooking: Is a unique approach to teaching all students core fundamentals of chemistry, biology and biochemistry in a food and cooking context. Provides clear explanations and practical insights to future chefs, dietitians, and scientists alike Includes learning objectives, key concepts and end of chapter questions Contains a new selection of detailed recipes

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chemistry in cooking: *The Chemistry of Cooking and Cleaning* Ellen Henrietta Richards, Sophronia Maria Elliott, 1897

chemistry in cooking: *What's Cooking in Chemistry* Hubertus P. Bell, Tim Feuerstein, Carlos E. Güntner, Sören Hölsken, Jan Klaas Lohmann, 2003-08-08 60 well-known chemists provide favorite recipes. Includes biographies.

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chemistry in cooking: *The Chemistry of Cookery* W. Mattieu Williams, 2022-09-16 In *The Chemistry of Cookery*, W. Mattieu Williams embarks on a pioneering exploration of the scientific principles underlying culinary practices. Through a meticulously structured narrative, Williams delves into the chemical reactions that occur during cooking, presenting complex information in an accessible style suitable for both laypersons and those with scientific inclinations. This work is set against the backdrop of the Victorian era's burgeoning interest in science and technology, shedding light on how chemical processes transform raw ingredients into delightful dishes, ultimately aiming to elevate culinary art to a more systematic discipline. W. Mattieu Williams was an esteemed chemist and a passionate advocate for popularizing science, evidenced by his contributions to various scientific societies and publications. His background in chemistry, coupled with a deep appreciation for the domestic arts, motivated him to write this groundbreaking work. Williams recognized the prevalent myths and misconceptions surrounding cooking and sought to replace them with empirical understanding, thus bridging the gap between science and the everyday kitchen experience. For anyone intrigued by the intersection of science and gastronomy, *The Chemistry of Cookery* is an indispensable resource. It not only empowers readers with knowledge to refine their cooking techniques but also challenges them to view cooking through a scientific lens, ensuring that every meal prepared is not just an act of sustenance, but an exploration of chemistry in daily life.

chemistry in cooking: *The Science of Cooking* Peter Barham, 2000-10-04 A kitchen is no different from most science laboratories and cookery may properly be regarded as an experimental science. Food preparation and cookery involve many processes which are well described by the physical sciences. Understanding the chemistry and physics of cooking should lead to improvements in performance in the kitchen. For those of us who wish to know why certain recipes work and perhaps more importantly why others fail, appreciating the underlying physical processes will inevitably help in unravelling the mysteries of the art of good cooking. Strong praise from the reviewers - Will be stimulating for amateur cooks with an interest in following recipes and understanding how they work. They will find anecdotes and, sprinkled throughout the book, scientific points of information... The book is a pleasant read and is an invitation to become better acquainted with the science of cooking. - NATURE This year, at last, we have a book which shows how a practical understanding of physics and chemistry can improve culinary performance... [Barham] first explains, in a lucid non-textbooky way, the principles behind taste, flavour and the main methods of food preparation, and then gives fool-proof basic recipes for dishes from roast leg of lamb to chocolate soufflé. - FINANCIAL TIMES WEEKEND This book is full of interesting and relevant facts that clarify the techniques of cooking that lead to the texture, taste and aroma of good

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chemistry in cooking: The Chemistry of Cooking Deon T Miles, 2013-01-01

chemistry in cooking: Researches on the Chemistry of Food Justus Freiherr von Liebig, William Gregory, 1847

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