

Chemical Analysis

The forensic scientist must have not only the means to analyze chemicals found at the scene and on the suspects, but enough knowledge of the uses of the chemicals so that the meaning of finding a chemical somewhere is known. For instance if a crime is committed in a kitchen, then finding sodium bicarbonate on the floor says more about the cleanliness of the cooks than about the crime. On the other hand, if the crime is committed in the kitchen and Lithium Chloride was found at the scene, the Forensic Scientist would take notice of that as a clue. If a suspect is a busboy, one should not be surprised to find cornstarch on him or her. On the other hand, one would have to wonder where a busboy picked up sodium acetate. Therefore as you investigate the chemicals, you will not only want to become familiar with the best tests for each of the 15 substances, you will also want to become familiar with their common names and uses so that you can evaluate which chemicals found at the scene and on the suspects are normal and hence not likely to be clues, and which are out of place and therefore likely to be clues. You also need to be able to explain the chemical basis for your identification. That is you need to be able to give the chemical equations for any chemical reactions that occur.

Chemical analysis

Name	Symbol	Uses	Water	pH	Conductivity	Hot Water	HCl	NaOH	I ₂	Benedicts	Flame Test	Observations
Sodium Acetate	NaC ₂ H ₃ O ₂	deicer, heating packs	VS Exothermic	8	>2000 μs	VS	NR	Does not dissolve	Yellow	NR	Yellow	Very fine white powder
Sodium Chloride Table Salt	NaCl	Food, ice melt, water softener	S Exothermic	6	>2000 μs	S	NR	Dissolves slowly	Yellow	NR	Yellow	White regular crystal
Sodium Bicarbonate Baking Soda	NaHCO ₃	Food	S Exothermic	8	>2000 μs	VS	Fizz	Dissolves	Yellow	Reacts to form Bubbles in heat	Yellow	Very fine white powder
Sodium Carbonate	Na ₂ CO ₃	making glass, soaps, paper	Slowly Clumps	10	>2000 μs	S	Fizz	Does not dissolve	Clear	NR	Yellow	White powder
Lithium Chloride	LiCl	for bipolar disorder	VS Exothermic	6	>2000 μs	VS	NR	Dissolves slowly	Yellow	NR	Red	Large Crystals
Potassium Chloride	KCl	salt substitute, CO ₂ laser production	VS Exothermic	6	>2000 μs	VS	NR	Dissolves slowly	Yellow	Turns green with heat	Purplish	Pinkish crystal
Calcium Sulfate Gypsum	CaSO ₄	manufacture cement, sulfuric acid	VS Exothermic	6	>2000 μs	NS	NR	Does not dissolve	Yellow	NR	Does not Burn	Lumpy powder
Calcium Nitrate	Ca(NO ₃) ₂	fertilizer, ice melt, glass manufacture, meat preserve.	VS Exothermic	7	>2000 μs	VS	NR	Does not dissolve	Yellow	NR	Red-orange sparks like fireworks	Huge clear crystals
Calcium Carbonate Marble Limestone	CaCO ₃	diet supplement, building industry	NS	6	123 μs	NS	Fizz	Does not dissolve	Yellow	NR	Glows bright, but does not burn	Lumpy powder, sticks to everything

Name	Symbol	Uses	Water	pH	Conduc- tivity	Hot Water	HCl	NaOH	I ₂	Benedicts	Flame Test	Observations
Cornstarch		Food	NS	6	42 μs	S	NR	Clumps	Blue Black	Red brown on heating	Burns w/yellow flame	Lumpy powder
Glucose	C ₆ H ₁₂ O ₆	Food	S Clumps	6	17 μs	VS	NR	Dissolves	Yellow	NR	Melts, burns with yellow flame	Irregular white crystal
Sucrose	C ₁₂ H ₂₂ O ₁₁	Food	VS Exothermic	5	83 μs	VS	NR	Dissolves	Yellow	Red brown on heating	Melts, burns with yellow flame	Irregular yellowish crystal
Magnesium Sulfate Epsom salts	MgSO ₄	Treating sprains	VS Exothermic	6	>2000 μs	VS	NR	Does not dissolve	Yellow	NR	Boils off water of hydration, but does not burn	Cylindrical crystals
Boric Acid	H ₃ BO ₄	Eye wash	Floats S	4	50 μs	VS	NR	Dissolves	Yellow	Bubbles on heating	Green flame	Can be either powder or crystal
Ammonium Chloride	NH ₄ Cl	making dry cell batteries, medical treatments, textile printing	VS Exothermic	6	>2000 μs	VS	NR	Smell ammonia	Yellow	Turns dark blue immediately	Polymerizes	Irregular clearish crystal

Dichotomous Key