

**LIONKEM™**



**INDUSTRIAL SCIENTIFIC**

**Ferric Chloride Powder  
User Guide**

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## About Lionkem Ferric Chloride

Ferric chloride is an orange to brown-black solid that is slightly soluble in water and is noncombustible. It is widely used in water purification, sewage treatment and as an etching agent for manufacturing Printed Circuit Boards for hobbyists.

Table 1: About Lionkem Ferric Chloride Powder

<p>Chemical Safety</p>	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>Corrosive</p> </div> <div style="text-align: center;">  <p>Irritant</p> </div> <div style="text-align: center;">  <p>Health Hazard</p> </div> <div style="text-align: center;">  <p>Environmental Hazard</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 10px;"> <div style="text-align: center;">  <p>Toxic</p> </div> <div style="text-align: center;">  </div> </div>
<p>Molecular formula</p>	$FeCl_3$
<p>Density</p>	$2.90 \text{ g/cm}^3$ (Anhydrous)
<p>Melting point</p>	$307.6^\circ\text{C}$
<p>Boiling point</p>	$316^\circ\text{C}$
<p>Synonyms</p>	Ferric Chloride Iron (III) Chloride Iron trichloride
<p>Molecular Weight</p>	$162.20 \text{ g/mol}$

## Procedure for PCB etching

### Step 1 – Getting Ready

The first step is to get the circuit layout transferred to the copper clad board (toner transferred or laser engraved) and the necessary equipment ready, including:

Table 2: Essential Items

No	Component	Quantity
1	Lionkem Ferric Chloride Powder	1
2	Measuring cup*	1
3	Latex Gloves*	1 pair
4	Safety goggles*	1
5	Lab Coat or Raincoat*	1
6	Dust mask or Face Shield or Respirator*	1
7	Etching Tray (Plastic or glass) *	1
8	Plastic or any other non-metallic rod*	1
9	Tongs or Tweezers (Plastic/Glass/Stainless Steel) *	1
10	Litmus Paper*	-
11	Towel*	1
12	Water*	-
13	Newspapers or Old Cloth*	-
14	Isopropyl alcohol (surgical spirit) *	1

**\*These items should be purchased separately.**

### Step 2 – Preparing the Ferric Chloride solution.

2.1 Layout newspapers or old cloth on the work area so that the work area doesn't stain when chemicals are spilled. Place the etching tray on the work area.

2.2 Weigh a suitable amount of Ferric Chloride powder depending on the size of the PCB using a weighing scale with the glass tray or plate on it.

**NOTE – Before weighing the Ferric Chloride, zero the weighing scale with the glass plate or tray first.**

*The dilution mixing ratio between Ferric Chloride and Water is 1:4 (w/v). For example, if 25 grams of Ferric Chloride is used, 100 ml of water is required to prepare the solution.*

2.3 Fill water into a measuring cup to a volume based on the ratio mentioned in Step 2.2. Pour the water into the etching tray.

2.4 Add the weighed Ferric Chloride powder as in Step 2.2 into the water in small amounts and stir the solution using a plastic or any other non-metallic rod until the Ferric chloride has dissolved. The etch bath is now ready.

**Caution:** *Never add water to the Ferric Chloride Powder as this produces a lot of heat and can produce steam and splattering all over the place. Make sure you always wear your protective gear (Latex Gloves, Safety goggles, Boots and a Lab Coat or Raincoat covering the entire body etc.) as the chemicals are corrosive, toxic and are dangerous to the eyes. Do not inhale as it is hazardous to the respiratory system.*

2.5 Dip the copper clad board with the layout transferred into the Ferric Chloride solution and shake the etching tray back and forth slowly until the unwanted copper region fades away. The PCB has been etched!

**Tip** – *The etching time totally depends on the concentration and the temperature of the solution. Use warm distilled water to reduce the etching time. PCB pouring also reduces etching time.*

2.6 To complete the process, take out the etched PCB from the Ferric chloride solution and rinse the PCB using clean bathwater.

2.7 Remove the ink stains on the PCB using Isopropyl alcohol (surgical spirit).

## Disposal Method

### Step 1 – Neutralizing the Ferric Chloride Solution

Mix the Ferric Chloride with Sodium Bicarbonate (Baking Soda) or Sodium Carbonate (washing soda) until a pH level of 7 to 8 is achieved.

### Step 2 – Separate the solid from the solution.

Once you are done mixing, the copper sludge settles at the bottom and a clear liquid at the top. Pour off the clear liquid into the drain with the water running. Dry the sludge and store it in a bag for hazardous waste disposal.

**Caution:** *Do not breathe the dust of the dry Copper sludge. Make sure you always wear your protective gear (Gloves, Safety goggles, etc.).*

## Safety measures

1. Wash thoroughly after handling.
2. Make sure to wear gloves to cover your hands up to the elbow and a facemask or face shield to cover the entire face including eyes, nose, mouth, neck, and ears.
3. Wear a lab coat or a raincoat that is long enough to cover the body as used inside a scientific laboratory and wear boots to cover up to a few inches below the knees.
4. Make sure to work in a place with enough ventilation and avoid breathing concentrated air.
5. Keep out of reach of children. If drink or eat by accident, immediately seek medical attention.
6. If in your eyes, rinse cautiously with water for several minutes and immediately seek medical attention.
7. If on your skin, remove all contaminated clothes and footwear immediately. Drench the affected skin with running water for 10 minutes or longer and if substance is still on skin. Consult a doctor.