

# Atomic Spectra: Flame Tests

Colored. Fireballs. Nuff Said

## Chemicals and Equipment Needed

- Box of spray bottles – **R4**
  - LiCl, NaCl, KCl, CaCl<sub>2</sub>, SrCl<sub>2</sub>, BaCl<sub>2</sub>, CuCl<sub>2</sub>, NiCl<sub>2</sub>, boric acid
  - Small amounts of salt dissolved in methanol
  - See below for instructions for making more solution
- Bunsen burner – **T**
  - Use propane torch (**A4**) for rooms without a gas hookup
  - Secure torch with iron ring on short ringstand – **J**
- Matches – **U1**
- Fire extinguisher – **next to A**
- Flame retardant lab coat – **next to M**
- Goggles – **D**

## Hazards

- Methanol is VERY FLAMMABLE
- This demonstration must be performed in a chemistry-style classroom with a lab bench
- You must wear a flame retardant lab coat
- This demonstration does not leave the chemistry complex

## Preparation

- Set up Bunsen burner or torch.
- Turn all the spray bottle nozzles to “spray” and test spray them in the sink.
  - Sometimes the heads clog and break, so there are extra nozzles on top of **EFGH**

## Presentation

- Please be careful. This demo is legitimately dangerous.
- Make sure the box of spray bottles is very far away from the flame
- Light the burner.
- Standing at arm’s length, and using short, quick sprays, spray the MeOH/salt solution through the flame. COLORED FIRE!
- Colors observed:

LiCl	red	CaCl <sub>2</sub>	orange-red
NaCl	yellow	SrCl <sub>2</sub>	deep red
KCl	lavender	BaCl <sub>2</sub>	pale green
NiCl <sub>2</sub>	peach	Boric acid	green
CuCl <sub>2</sub>	blue-green		

- Make sure to switch all the nozzles to “off” before putting away.

## NOTES:

- We totally stole this from the first episode of Breaking Bad
- Sometimes the spray bottles just need to be topped off with methanol
- To make more solution, add a microspatula-sized scoop of salt from the bottles of finely-ground salts stored in the dessicator (**back of J**), and add methanol (**R3**) to halfway up to the very first line on the bottle. It’s not a lot of methanol, maybe 20-30 mL.

# Atomic Spectra: Flame Tests

Older, safer, less awesome version

This is an extremely simple yet effective method of demonstrating atomic spectra.  
Kids especially like it, making a good demo for outreach programs.

## Chemicals and Equipment Needed

- Dessicator – **back of J**
  - Finely-ground LiCl, NaCl, KCl, CaCl<sub>2</sub>, SrCl<sub>2</sub>, BaCl<sub>2</sub>, CuCl<sub>2</sub>, boric acid
  - Use the squeeze bottle versions
- Propane torch – **A4**
- Ringstand with iron ring large enough for propane torch – **J**
- Striker – **U1**

## Preparation

- Set the propane torch in the iron ring and adjust the height so the torch is stable on the base of the ringstand.

## Presentation

- Light the propane torch.
- To display the flame color of each metal, squeeze the bottle of salt quickly to squirt some powdered salt into the air intake of the torch. The salt will be swept into the flame, displaying the characteristic flame colors.
  - Not all of them work as well as the methanol version
- Save the CuCl<sub>2</sub> for last, as it sometimes contaminates the burner.
- Colors observed:

LiCl	red	CaCl <sub>2</sub>	orange-red
NaCl	yellow	SrCl <sub>2</sub>	deep red
KCl	lavender	BaCl <sub>2</sub>	pale green
Boric acid	green	CuCl <sub>2</sub>	blue-green