

Flame Tests

Description: Methanol solutions of salts are burned to observe that different wavelengths of light are emitted by different materials

Materials:

Methanol	Petri dish
NaCl (yellow)	Cover (to extinguish flame)
SrCl ₂ (red)	
LiCl (red)	
KCl (violet)	
CuCl ₂ (green)	
CaCl ₂ (red-orange)	
H ₃ BO ₃ (green)	

Procedure:

Several variations exist including the “Petri dish” method (described here), the squirt bottle method (ref 1), the H₂ balloon method (ref. 2), the guncotton method (ref 3) and the Magic Eraser method (ref 4).

1. Sprinkle a spatula full of each salt into separate Petri dishes.
2. Cover salt with methanol (10 mL). Turn off the lights for a better visual effect. Use the lighter to start up the flame for each sample.
3. To extinguish the flame, put the cover over the Petri dish and let cool before removing.

Discussion: When an element is burned, the electrons are excited. As the electrons from an excited state relax back to a ground state, they will emit photons of light. These photons will have different colors depending on the element and its discrete energy levels. That is, different wavelengths of light (colors) will be emitted when the electrons of different elements go down the step(s) between their energy level(s). Each element will have its own set of steps therefore each will have its own color.

Safety: Wear safety glasses and goggles while preparing and during the demonstration. Be sure to allow time for the cover to cool before removing.

Disposal: Any leftover salt can either be reused in another demonstration or dissolved in a small amount of water and disposed of in an aqueous waste container.

References:

Landis, A. M.; Davies, M. I. ; Landis, L. *J. Chem. Ed.* **2009**, *86*, 577.

Maynard, J. H. *J. Chem. Educ.* **2008**, *85*, 519.

Johnson, K. A.; Schreiner, R. *J. Chem. Educ.* **2001**, *78*, 640.

Thomas, N. C.; Brown, R. *J. Chem. Educ.* **1992**, *69*, 326.

Teacher guide (middle and high school grades): <http://www.creative-chemistry.org.uk/activities/documents/flametests.pdf>

Video:

<http://www.youtube.com/watch?v=Vmlj6B3mRaE>

<http://www.youtube.com/watch?v=jvS4uc4TbU>

<http://www.youtube.com/watch?v=QNojS6ZZ4og>