### Required Training
- UC Lab Safety Fundamentals

### Required PPE
- **Flame-resistant lab coat**, safety glasses/goggles, nitrile gloves

### Equipment
- Wide-mouth screw-top glass jars for mixing/storage
- Plastic dropper bottle for sulfuric acid
- Ceramic crucibles
- Flame-proof surface (or concrete)

### Chemicals
- Potassium chloride (KClO₃)
- Powdered sugar (C₁₂H₂₂O₁₁)
- Sodium nitrate (NaNO₃), potassium nitrate (KNO₃)
- Strontium nitrate (Sr(NO₃)₂), barium nitrate (Ba(NO₃)₂)
- Sulfuric acid (H₂SO₄), 18 M

### Procedure:

1. To prepare the instant fire mixtures, weigh out 20 g each of NaNO₃ (yellow), KNO₃ (lilac), Sr(NO₃)₂ (red), or Ba(NO₃)₂ (green) into the glass jar labeled for each color mixture. Add 10 g of KClO₃ and 10 g of powdered sugar to each jar and replace the screw tops (M(NO₃)₃:KClO₃:sugar, 2:1:1). Gently roll the closed jars to thoroughly mix the powders – **DO NOT** grind them together in a mortar, as the friction could cause the mixture to ignite. If the particle size of the powders is too large, they can be ground individually before adding to the container. Be sure to carefully wash and thoroughly dry the mortar and pestle in between powders. Alternatively, the powders can be mixed by brushing through a fine mesh screen or tumbled together on a large piece of paper.

2. Pour one scoop (~1-3 g) g of the instant fire mixture into a ceramic crucible, one for each color.

3. Set the crucibles on a fire-proof surface, such as concrete. Make sure the crucibles are at least 2 feet from each other, to prevent accidental ignition by flying sparks.

4. Drop 1-2 drops of H₂SO₄ onto one of the instant fire mixtures and step away. The mixture will ignite after a few seconds and burn intensely for 10-15 seconds, depending on the volume of the mixture in the crucible. If the mixture fails to ignite with the first drops of H₂SO₄, wait 10-20 seconds before adding another 1-2 drops. **Caution** – the combustion may send sparks and small amounts of burning salt mixture flying up to 1-2 feet away, and the extreme heat may cause the ceramic crucible to shatter. Keep the audience and other performers at least 10 feet from the demo.

**Clean-up:** Allow the crucibles to cool completely before attempting to move them. Once cool, the remaining solids in the crucible that contained Ba(NO₃)₂ should be collected and disposed of as hazardous waste, while the solids from the other mixtures may be rinsed down the drain with water.
Hazard: H$_2$SO$_4$ is strongly oxidizing and corrosive, and will cause immediate chemical burns on contact. It must be stored in a sealed secondary container to prevent accidental ignition of the bulk instant fire mixtures. The ceramic crucibles will become extremely hot during the demonstration, and could cause thermal burns. If a crucible shatters, wait until the pieces have completely cooled before sweeping them up. Ba(NO$_3$)$_2$ and its decomposition products are toxic, and should not be released into the environment. The sodium and strontium mixtures produce the brightest colors, and the audience should be warned not to look directly at these mixtures while they are burning.

Principle: KClO$_3$ reacts with H$_2$SO$_4$ to produce chloric acid (HClO$_3$), which is extremely reactive and will cause spontaneous ignition on contact with any organic materials, such as sugar. The metal nitrates also acts as oxidizers to support combustion, and the heat of the reaction causes electronic excitations in the metal cations, which then emit light at characteristic wavelengths as they relax back to the ground state: sodium emits yellow; potassium emits lilac or violet; strontium emits red; and barium emits green.

Notes: The green color of the barium mixture is slightly harder to see, and the potassium mixture appears almost white in direct sunlight. For a more efficient burn, the reagents should be fine powders before mixing; each component may be ground in a mortar separately for 1-2 minutes, provided the mortar is cleaned between components to prevent cross-contamination that could lead to spontaneous ignition. If the H$_2$SO$_4$ browns at all, replace with fresh solvent. Browned, mucky H$_2$SO$_4$ will result in poor ignition.