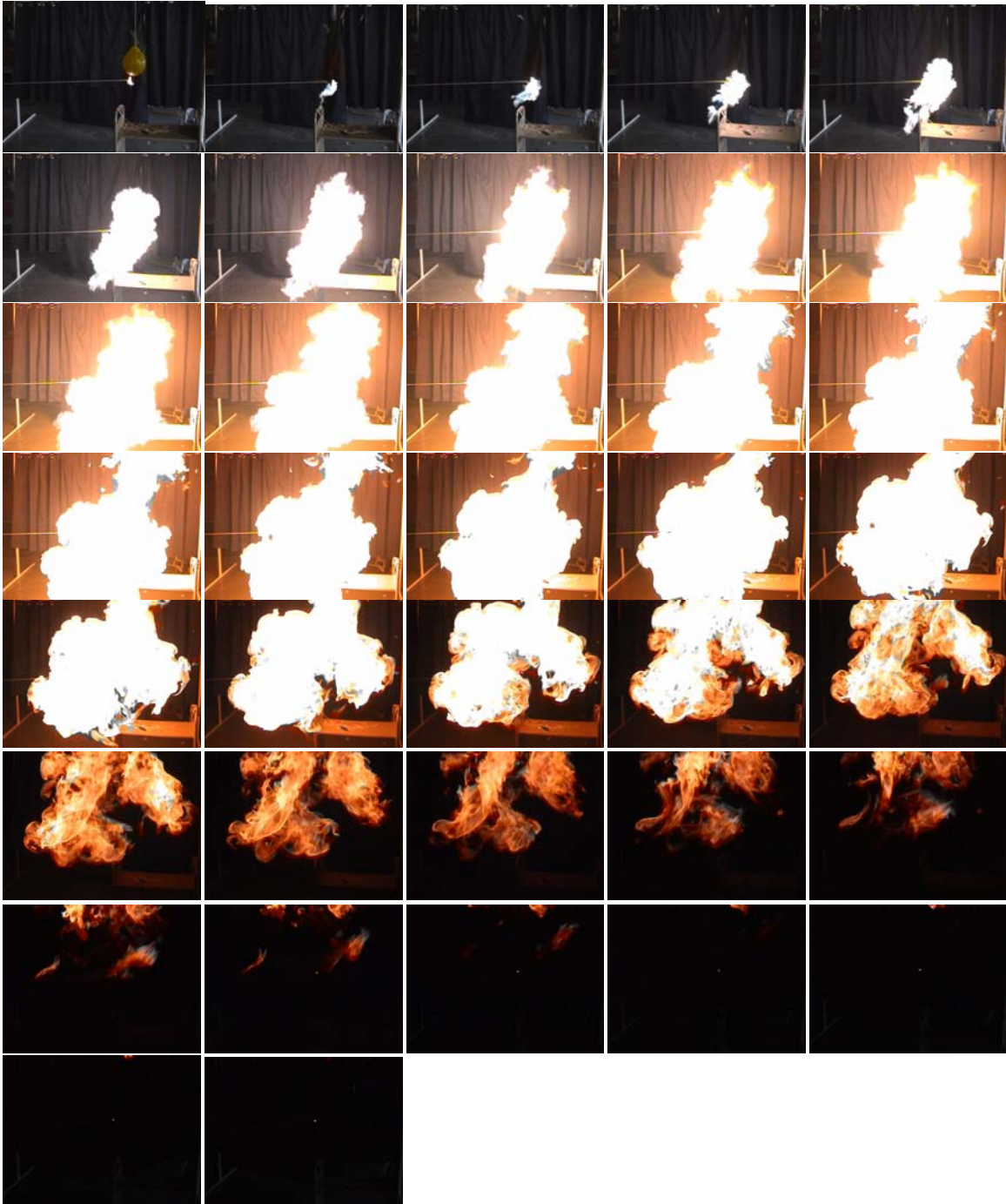


How Propane Ignites or Detonates

So as to demonstrate that hydrogen can be used safely, it needs to be shown a comparison to an existing fossil-type fuel that students are familiar with using. Propane is used as it is common to grills, stoves, home torches, and is similar to butane of lighters, methane and ethane of natural gas used for heating and cooking in homes. Propane is a fuel that has 2-9% limits of flammability and 3-6% limits of detonation. The propane needs to mix with more air before it will ignite so that it creates a much larger fireball. It is heavier than air so it first sinks towards the ground while it is beginning to ignite and then as the hot gasses expand the ball of flames travels upward. The size of the balloon again limits the total size of the fireball. A 5" balloon (half the diameter of the 10" balloon and about 1/8 the volume) is great plenty to demonstrate the nature of propane. (The images in the photos below were taken using the full 10" balloon to create a maximum extent of flames of ~2 meters in diameter and 3 meters high). A five inch balloon is limited to about half of that. A two meter stick is used for ignition that also emphasizes the safety in the demonstration. The images get reviewed to show that the propane burns for about 2 seconds and is much larger in size. I feel that propane is essential to this demonstration of hydrogen. The fact that propane can be far more dangerous than hydrogen, yet we work with it every day is a critical message to disseminate so that people are not left with the idea that hydrogen is too dangerous to handle and too dangerous to consider as an option.



With a method for rapidly detecting hydrogen at concentrations that are far lower than what will ignite, hydrogen will actually be much safer than existing fossil fuels such as propane because a very tiny leak can be detected and be fixed before concentrations ever are allowed to reach dangerous levels. If hydrogen is to be considered as an alternative energy carrier for our society, this needs to be conveyed.