9.5 Hybrid orbital analogy

Subjects: Molecular structure, hybrid orbitals

Description: Two liquids, one blue and one yellow, are combined to form one green solution as an analogy for hybrid orbitals.

Materials:
2 250 mL beakers
Blue food coloring
Yellow food coloring
water

Procedure:
1. Put 75 mL of water to each of the two beakers.
2. Add one drop of blue food coloring to one beaker of water and one drop of yellow food coloring to the second beaker of water.
3. Pour one liquid into the other to form a green solution. Pour half of the green solution back into the other beaker so that you have two beakers with equal amounts of green solution.

Discussion:
Atomic orbitals can mix to form hybrid orbitals that aid in bonding. The number of hybrid orbitals created is always equal to the number of orbitals that produced them. The new orbitals have a different direction in space than the original orbitals. This demo is an analogy for the creation of an sp hybrid orbital. Two solutions of different colors are combined to form two equal solutions of a third, hybrid color.

Hybrid orbitals are created by mixing s orbitals with p and d orbitals. The hybrid orbitals are directed toward the terminal atoms, leading to better orbital overlap and a stronger bond between central and terminal atoms.

Safety:
None

Disposal:
Solutions may be poured down the drain.

References:
1. Prof Botch
2. J. Kotz, P. Treichel, J. Townsend; Chemistry and Chemical Reactivity; 7th Ed.; Teachers Ed. Thomson/Brooks/Cole; 2009; p. 408-409