

## Electromagnetic Radiation: UV Beads

### *Preparer's Version*

#### **Introduction**

Electromagnetic radiation encompasses a broad spectrum of wavelengths, with ultraviolet (UV) radiation occupying a segment that is shorter in wavelength and higher in energy than visible light. UV radiation is classified into three types: UVA (320-400 nm), UVB (290-320 nm), and UVC (100-290 nm). While UVC is largely absorbed by the Earth's atmosphere, UVA and UVB reach the surface and have significant biological effects. UV radiation is particularly hazardous because its high energy can cause damage to DNA and other cellular components, leading to skin aging, sunburn, and an increased risk of skin cancers. In the context of a chemistry demonstration, the effectiveness of sunscreen can be visually illustrated using UV-sensitive beads, which change color when exposed to UV light. By comparing UV beads exposed to a UV blacklight with those covered in a sunscreen-coated cover under the same light, one can clearly observe the protective effect of the sunscreen. The beads under the sunscreen remain unchanged or change color much less than the exposed beads.

#### **Safety Hazards**

- Personal Protective Equipment
  - Safety glasses/goggles
  - Nitrile gloves

#### **Materials**

- UV beads
- High SPF (100 SPF) sunscreen
- UV blacklight
- 2 petri dishes and petri dish covers
- Powerstrip

#### **Procedure**

1. Fill each petri dish with a flat layer of UV beads.
2. Plug in the powerstrip into a wall or floor outlet.
3. Plug the UV blacklight into the powerstrip and check to see it has power and turns on.
4. Wearing nitrile gloves, coat the outside of the bottom of one of the petri dish covers with the sunscreen in a thick layer (nearly opaque). The other petri dish cover should be clean.
5. Cover one petri dish with the petri dish cover that is coated in 100 SPF sunscreen, and do not cover the other petri dish.
6. Place the UV blacklight over both of the petri dishes containing beads simultaneously and make sure that the light is on for approximately 5 minutes.
7. The two piles of beads should change a varying degree of color (the pile without sunscreen will be a deeper color than the pile with).

#### **Tips & Tricks**

- None.

#### **Clean-Up Procedures**

1. Keep the UV beads in a baggie. Clean off if necessary.
2. Clean petri dishes thoroughly with laboratory detergent.