HENRY ROYCE INSTITUTE

HOW TO MAKE A SPACESUIT?

OVERVIEW

DURATION: 30 minutes

TARGET AUDIENCE: Year 6+

Spacesuits must withstand extremely hostile environments and keep astronauts safe from the vacuum conditions, cosmic radiation and drastic temperature changes in space. Ultra Violet (UV) radiation is a big danger factor along with Infra Red (IR) rays, so special materials need to be used for protection. The aim of this activity is to show how different materials cope under some of the conditions found in space, ie. UV radiation and IR rays (extreme temperatures).

EQUIPMENT

- Thermal imaging camera
- Aluminium coated Mylar
- UV colour changing beads
- Petri dishes
- UV torches
- Sunglasses
- Gold coated petri dishes
- Transparent plastic films

METHODOLOGY

UV PROTECTION

1. Place small piles of UV beads into separate petri dishes.

2. Test out the UV resistance of the different see through materials with the UV light, checking to see if the beads change colour.

3. Use a different petri dish for each 'protective' materials.

4. When the beads do not change colour using the gold ptrei dish and the sunglasses, explain the properties of UV resistant materials.

HEAT PROTECTION

1. Allow the students to look around the room with the thermal camera to familiarise them with the images. People will appear red and their surrounds blue/purple showing heat is being emitted from the body.

2. Put the Mylar bib on to cover a student's body and demonstrate how the material reflects off the IR on the camera and can be seen to shield the wearers body heat. Use this demonstration to explain how why this materials is chosen for astronaut's space suits to protect them from extreme temperatures in space.

To access a full equipment kit for the 'How to make a spacesuit' activity contact **info@royce.ac.uk**

BACKGROUND SCIENCE

UV light is a dangerous form of radiation given off by the sun. There are three main types of UV light, UVA, UVB and UVC. The high levels of energy released by UV radiation means that it causes significant damage to the human body. It damages the skin causing sunburn and in the case of overexposure, leads to skin cancer. This is due to the direct DNA change it causes to skin cells. The eye is the most sensitive to UV light and most likely to get damaged. This can lead to cataracts, pterygium and pinguecula formation.

Most of the UV emitted by the sun is filtered out through the atmosphere before it arrives to Earth, but in space there is no protection, therefore special materials must be used to protect against harm. Gold is very good at reflected off UV light and allowing visible light to pass through, therefore the visor on an astronaut's helmet has a relatively thin gold coat on to protect their eyes. Gold also reflects IR rays allowing for thermoregulation to occur within the helmet as well.

Thermal regulation is extremely important in space because of the extreme temperatures and temperature changes that occur. Temperatures in space can vary from -233 to 122 °C. Aluminium Mylar is a key component of a space suit The suits used on the Apollo space missions, consisted of 5 layers of aluminised Mylar. The aluminium on the Mylar reflects IR and the Mylar insulates the suit and keeps the body heat in.

FOLLOW UP QUESTIONS

1. Why do the beads change colour?
2. How do you deal with the vacuum of space?
3. What does UV do to our skin?
4. Why use gold and not another material?

SAFETY

The UV light from the torch is not strong enough to cause severe damage, however, avoid shining the light into someone's eyes. The thermal imaging camera fires a laser when capturing a photo, therefore it should also not be shone into anyone's eyes.