

Totally RAD!

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Project ID#

Q1: Research Question/Engineering Goal

How can we prevent the exposure of dangerous radiations to future Mars settlers?

Q3: Data Analysis & Results

Accessibility was taken into consideration when deciding the best material for blocking alpha, beta, and gamma particles. It was determined by variables such as pricing, durability, and availability of material on Mars and Earth. Magnesium is abundant on both earth and the red planet (found in the regolith), "...has the advantages of low density(usually blocks better when denser), light weight, and high specific strength"(nature.com). With an accessibility score of 82.5%, magnesium was found to be the most accessible material to use while blocking. The geiger counter method was tested three original times for each material and each radiation source; it was later averaged to find the median result. Each material and radiation source was tested again over 30 minute periods to create a scatter plot.

Q2: Methodology/Project Design

Engineering countermeasures were used to find primary resources to shield Alpha, Beta, and Gamma particles. The two methods that the researcher will demonstrate to measure radiation exposure includes, the geiger counter method and the cloud chamber method. With the geiger counter, the researcher will place each material candidate between the radiation sources (Po-210, Sr-90, Co-60) and a detector (geiger counter). Using each of the different radiation sources, it will be determined which material blocks each radiation type and how much of the material is needed. The cloud chamber can be used to visually detect radioactive decay.

Q4: Interpretation & Conclusions

The researchers' goal was to test and discover a more effective shielding material that would aid in the blocking of radiation and that would be readily available for future Mars explorers and possibly settlers. The researchers' hypothesis that Magnesium will be the most efficient material was determined through experiment, to be correct. Following complex testing, the researcher discovered that the next best was glass and concrete was the worst substance for blocking radiation. The researcher attempted to keep all variables in check, but design errors such as temperature fluctuation and videography challenges occurred, making it difficult to record data. Radiation is one of the most prominent dangers to space travel, detrimental to all parts of the body, so it is important that people know more about this topic for a few reasons. First, for long-term exploration in space, next, the future of Earth's environment, making humans a multi-planet species, and last, possibly decreasing the likelihood of human extinction. Ideas for a continuation of this research project could be "Radiation shielding using magnetic fields" or "Further exploring different readily available materials or combining already known effective materials".