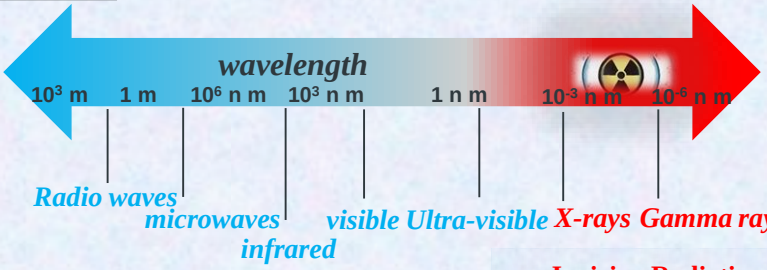
सीएसआईआर- एम्प्री
CSIR-AMPRI

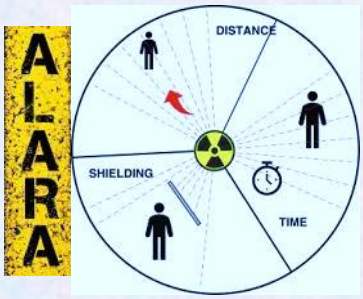
Joint Free Gamma and Neutron Shielding Bricks for Building X-ray Diagnostic Centers till Nuclear Power Plants

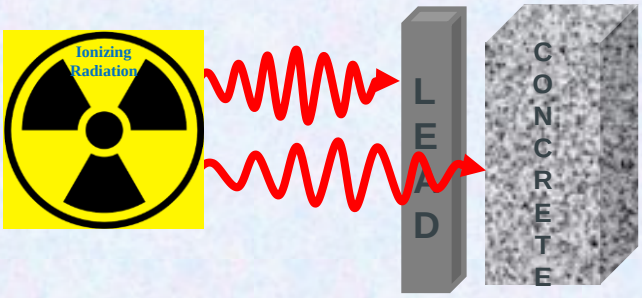
1 Radiation

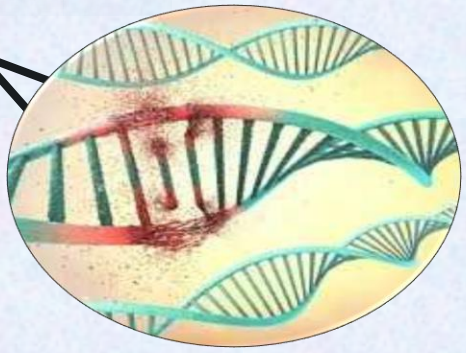
- An electromagnetic wave.
- Classified into two types: Non-Ionizing & Ionizing radiation.
- Ionizing radiations are: X-ray, gamma ray, neutron, alpha particles, etc.
- Hazardous due to its high energy (ionize and break DNA).
- Causes cancer & other acute radiation syndromes.



2 Radiation Shielding

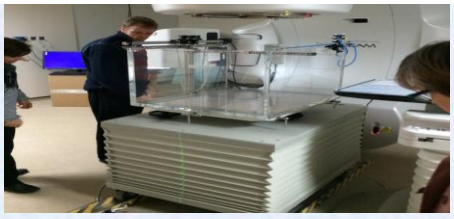






3 Applications

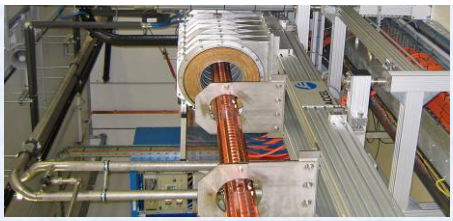
Linac Room



Nuclear Power Plants

Radiotherapy Bunkers

Particle Accelerator Room



4 Red Mud

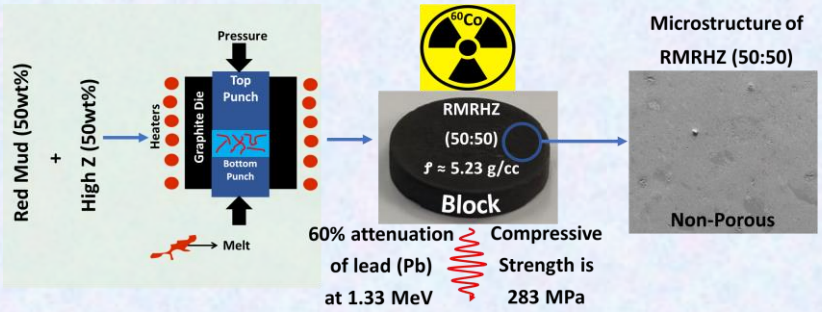
- Alumina Industry Waste.
- 1-1.5 tons produces per ton of alumina.
- Noxious due to its high alkalinity (pH>11).
- Heavy element leaching and pollute ground water.
- Contains iron 30-55%, suitable for radiation shielding.
- Currently 3-4% is utilized in cement industries.
- Disposal pond breach out and pollute the environment.

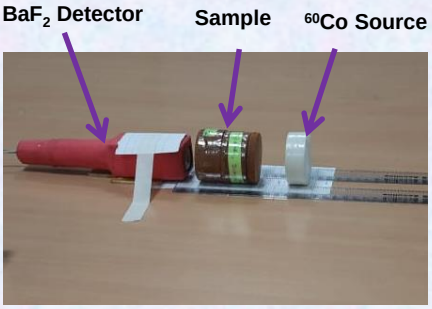
Stockpiled Red Mud Pond

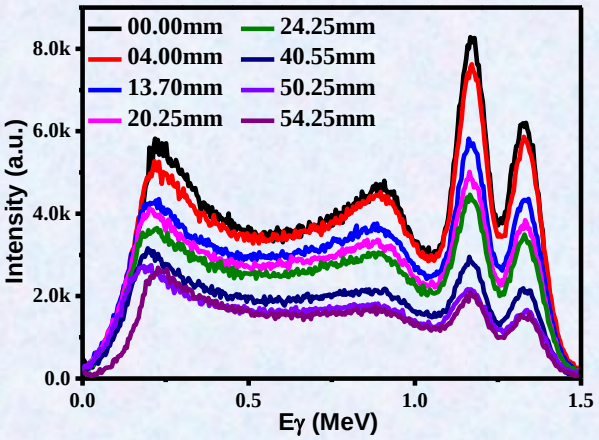
India: Toxic sludge leak from Vedanta's red mud pond threatens rural communities

NEWS
Red Mud Disaster in Hungary
The red mud disaster of October 4, 2010, followed the collapse o

5 Preparation of γ-Ray Shielding Block



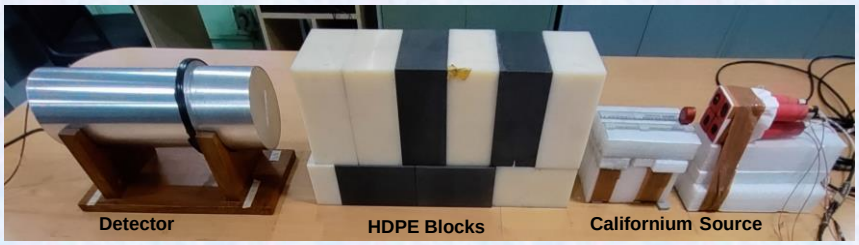


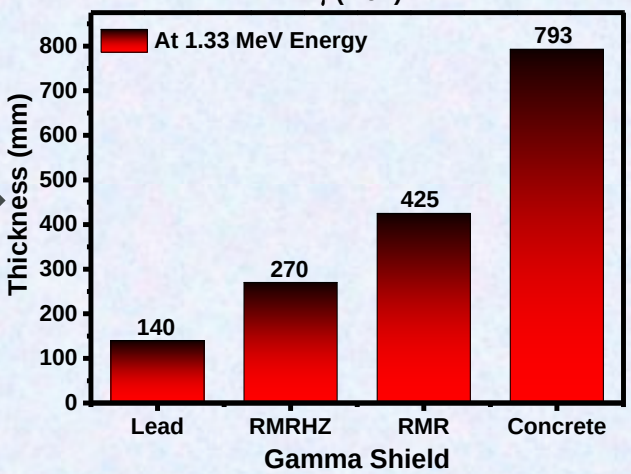


6 Salient Features

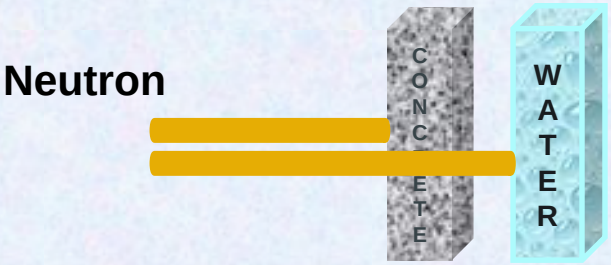
- Density ≈ 5 g/cc
- Porosity ≈ 2.75%
- HVL ≈ 21.08 mm at 1.33 MeV
- 60% attenuation of lead.
- Compressive Strength ≈ 283 MPa.
- Concrete Equivalent ≈ 270 mm
- No heavy elements leach out after hot compaction.
- Cost effective and environment friendly.

7 Neutron Shielding Block





- Attenuation equivalent to HDPE blocks.

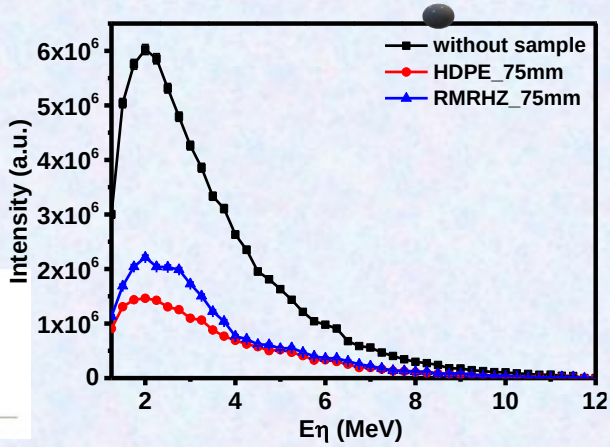


8 Potential Applications

- Can be used in nuclear power plants, particle accelerator rooms, radiotherapy bunkers, food sterilization plants etc.
- Reduce the usage of toxic-lead and heavy weight concrete for building radiation shielding structures.

9 Future Prospects

- Indian government are planning to make 20 more nuclear power plants by 2031.



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