Description

The creation of novel, high dense, long body multilayer cylindrical containers having high absorbing properties against neutron and gamma irradiation was developed at Tsulukidze Institute of mining and Technology. The cylindrical multilayer billets were obtained using explosive consolidation technology. The loading intensity were changed up to 10 GPa and low detonation velocity explosive materials such as ammonite (D=3.14km/sec) and its blend with saltpeter were used as an explosive materials. The basic multilayer container walls as well as bottom and cover consists from Al-B(B4C)-Pb(PbO)–Al(Fe) layers. The containers without inner Al(steel) layer and consisting from Al-B4C-Pb & Al-(B+Pb) layers were developed too. Depending on the intensity and density of irradiation the high enriched B10 isotope and oxide of Pb can be applied instead of common B and lead correspondently.

The new approach to consolidate and to fabricate long body billets in one time loading process makes possible to fabricate multilayer cylindrical containers with high dense layers from consolidated boron(B) and lead(Pb).

The novelty of this new approach hinges on the application specially developed schemes and assessors providing formation multilayer high dense walls and covers for containers.

The practical results of developed multilayer cylindrical containers and different parts are presented in Figures 1 and 2. It was established that developed containers are characterized with high absorbing and strength properties against neutron and γ irradiation, suitable, light during transportation and ecologically friendly.

There were carried out the comparative study of physical-mechanical properties and of structure /property relation of obtained consolidated multilayer containers.

Innovative Aspect and Main Advantages

The study of obtained multilayer containers and evaluating their efficiency for storage of radioactive materials shows the evident difference in contrast to conventional methods of storage nuclear waste and fuel. The simply and low cost technology of fabrication cylindrical containers that includes application only low cost and overdue industrial explosives and further simple treatments by lathe of obtained billets makes offered new type containers (figure 1) attractive having high commercial potential for modern countries.

Areas of Application

The developed multilayer cylindrical containers having high absorbing properties against neutron and γ irradiation successfully may be applied during the storage and transportation of nuclear waste and nuclear fuel.

Figure 1. The pilot sample of developed multilayer container Al-(B4C+Pb)-steel. A) General View; b) Separated cover and body of container.

Figures 2. Explosively fabricated billets (different dimensions) of container's central parts with different content of protective layer.

Stage of Development

The development is ready for patent application and licensing.

Contact Details:

Dr. Akaki Peikrishvili
Science and Technology Centre in Ukraine
Information Office in Tbilisi
7, E. Mindli str. Tbilisi, 0186, Georgia
Tel: (+995.32) 321657
Email: stcu@internet.ge; akaki.peikrishvili@stcu.int