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A New Approach to Environmentally Safe Unique Identification of Long-Term Stored Copper Canisters

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A new approach to environmentally safe unique identification of long-term stored copper canisters is suggested in this paper. The approach is based on the use of a tungsten-based insert placed inside a copper cask between a top iron lid and a copper lid. The insert/label is marked with unique code in a form of binary number, which is implemented as a combination of holes in the tungsten plate. In order to provide a necessary redundancy of the identifier, the tungsten label marked with few identical binary codes. The position of code (i.e. holes in tungsten) corresponds to a predefined placement of the spent fuel assemblies in the iron container. This is in order to avoid any non-uniformity of the gamma background at the canister surface caused by a presence of iron-filled spaces between spent nuclear fuel assemblies. Due to the use of the tungsten material gamma rays emitted by the spent fuel assemblies are collimated in a specific way because of strong attenuation properties of tungsten. As a result, the variation in the gamma-counting rate in a detector array placed on the top of copper lid provides the distribution of the holes in the tungsten insert or in other words the unique identifier. Thus, this way of identification of copper cask do not impair the integrity of the cask and it offers a way that the information about spent nuclear fuel is legible for a time scale up to a few thousands years.

Country or International Organization

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