New soil-hardening material for leakage-proof levee and simple pavement

A new environment-friendly soil-hardening agent called 'Mug White' has been developed in Japan, primarily for use in the construction of leakage-proof levee and simple pavement in the field. Its main ingredient is light-burned magnesia, and it can be a good substitute for cement solidification agents, which are usually high in alkali content (pH 14).

Characteristics of Mug White

1. The main ingredients of Mug White are light-burned magnesia, soluble phosphate, carbonate, and citric acid. Hence, after grinding, it can be used as a fertilizer.
2. The pH of Mug White is nearly neutral. In experiments conducted with freshwater animals (medaka and pond snail, aquatic plants, and seawater animals such as short-neck clam), no death was recorded from the use of Mug White.
3. Mug White can harden even soils with high water content, such as organic soils and sediments at rivers, lakes, marshes, and reservoir. Also, Mug White makes it difficult for heavy metals contained in the soil to melt. Therefore, the hardened soil is reusable.
4. The hardened soil maintains the original soil color (Fig. 1). Therefore, it can harmonize with the surrounding landscape.

Principle of hardening

When Mug White and soils are mixed, the light-burned magnesia in Mug White and the water in soils are combined. Consequently, magnesium hydroxide is formed, as well as a combination of magnesium hydroxide and phosphate. Magnesium carbonate is also formed from magnesium hydroxide and carbon dioxide. Through this process, the soil is hardened and intensified.
Application

- **Secondary products**
  When soils are used as the main material for secondary cement products, the required intensity or strength of such products is difficult to obtain. However, with the use of Mug White, soils can be used to produce secondary cement products with the desired intensity or strength.

- **Levee**
  Levee and canal lining constructed with the use of Mug White has proven to be leakage proof (Figs. 2 and 3). Consequently, water resources are used effectively and fertilizer leaching is reduced. Also, labor in terms of mowing has become much lighter. Furthermore, the intensity of the hardened levee can be adjusted. After grinding the hardened levee, it can be used as a fertilizer.

- **Simple pavement**
  Mug White can also be used to build pavements (Fig. 4), by mixing it with soil and compacting the mixture at the site.

- **Mulching to prevent soil erosion**
  After mixing Mug White, water and viscous agent, the mixture can be used to cover the ground surface, preventing soil erosion caused by rainfall.

- **Environment-friendly pavement technology**
  Conventional wood tip pavement is costly and not durable. Hence, Mug White can be used as a solidifying agent for wood tip pavement that is durable and with high permeability and water retention characteristics.

![Fig. 3. Canal lining](image)

![Fig. 4. Pavement construction](image)