

Erosive Wear Resistance of Sri Lankan Rocks Used for Flooring

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Introduction

Varieties of floor tiles are amongst many of the specialties in ancient Sri Lankan architectural wonders. Even today floor tiles in Sri Lanka claim a high regard in world export market being one of the biggest equity grosser in commodities. Stone floors are admired for their splendid appearance as well as for higher durability. Natural stones such as slate, granite, gneisses and marble are commonly used for interior designs and flooring.

Stone floor tiles being materials which are always in physical contact with moving objects, are prone to wear, although at a comparatively slower rate. Therefore, the durability of tiles should also be of concern in addition to their aesthetic appearance. However, wear resistance of stone floor tiles has not been attracted adequate attention in material testing. Hence, it is essential to ascertain tribological properties, including resistant to wear, when selecting the most suitable flooring material. This research aims at investigating and documenting the wear resistance of commonly used Sri Lankan rocks in flooring.

Experimental Procedure

Sri Lankan rocks used in floor tile industry are mainly high-grade metamorphic gneissic rocks having varying mineralogical compositions and textural characteristics. Granites and granitic gneiss, charnockites and charnockitic gneiss, migmatitic gneiss, garnet granulite, and garnet-biotite gneiss were used for testing. In addition an imported slate sample was also tested. Small thin slabs of rocks with dimensions 5 mm x 5 mm x 1 mm were prepared as the testing materials. Quartz slabs of same dimensions were used as the control material. A slurry pot tester was used where silicon carbide particles suspended in distilled water was used as the erodent. Specimens were mounted on a nylon disk which was rotating at a constant speed while being immersed in the slurry. Erosion of the specimens was determined as a function of time by measuring the mass loss of all eight materials at regular time intervals.

Erosion of the specimens was determined by measuring the mass of loss as a function of time. For this, the test was interrupted after suitable time intervals and the specimens were unclamped from the rig and dried in the oven before measuring the weight.

Results and discussion

As expected, quartz specimen showed the highest resistance to erosive wear. Therefore, its use as the control material can be justified. Figures 2a, 2b and 2c show cumulative erosion of the tested samples plotted as functions of time. Granite specimen shows the least erosion among the test samples in the first batch of tests (Figure 2a). Therefore it has a high resistance to wear compared to the other test samples. Slate is considered as comparatively a soft rock. It shows the least resistance to wear.

In the second batch of tests, the medium to fine-grained granitic gneiss specimen indicates higher resistance to wear. Coarse-grained granite is relatively prone to erosion and thus has a low erosive wear resistance (Figure 2b). As shown in Figure 2c, in the

third set of tests, garnet granulite shows the lowest erosion rate and it has a higher resistance to wear while garnet-biotite gneiss has a relatively lower resistance

Figure 3 summarizes cumulative erosion of all tested samples. Medium to fine-grained gneiss indicates highest resistance to wear among all samples.

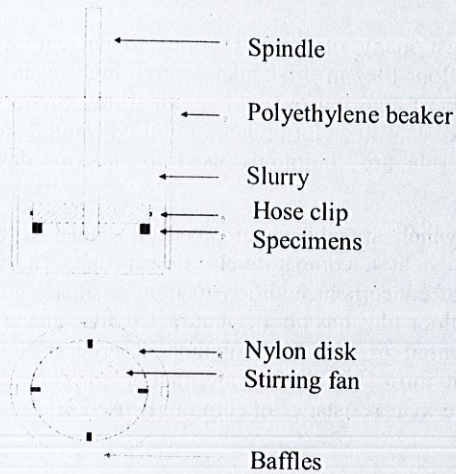


Figure 1 : Schematic diagram of the slurry pot tester (after Wijayasinghe, 1999)

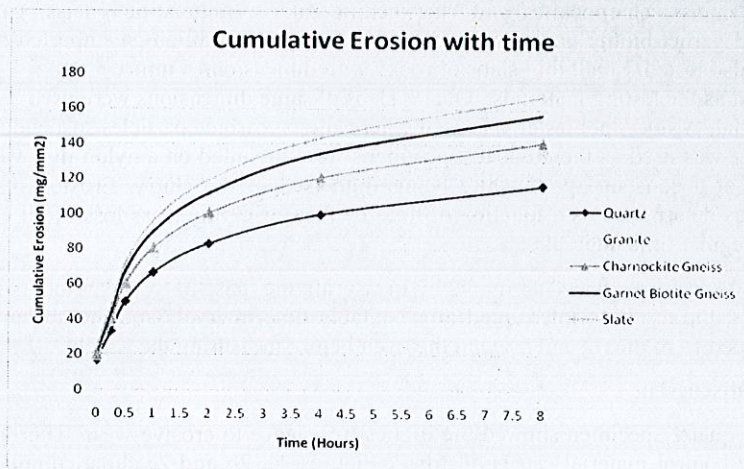


Figure 2 (a): Cumulative erosion of selected rock specimens.

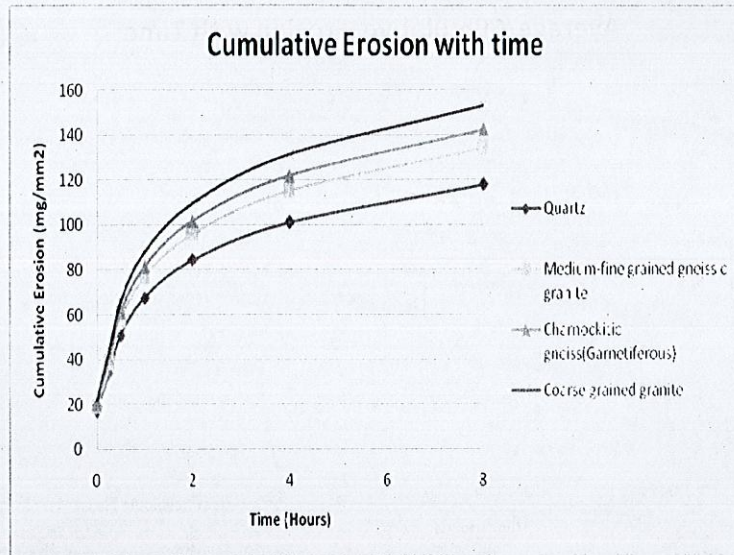


Figure 2 (b): Cumulative erosion of selected rock specimens.

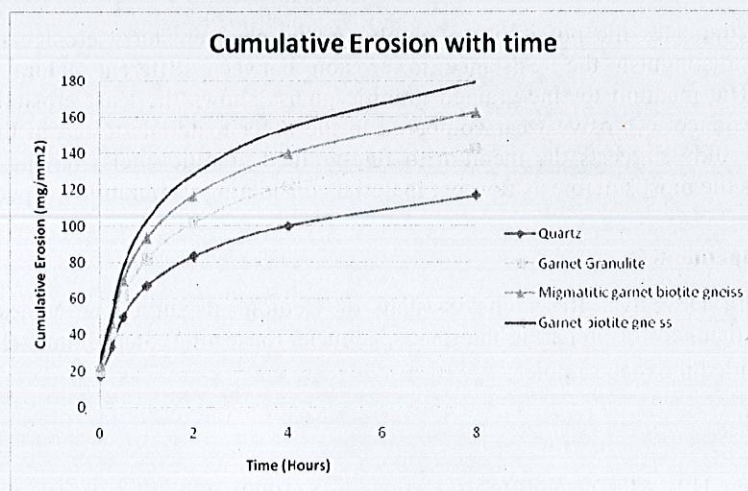


Figure 2 (c): Cumulative erosion of selected rock specimens.

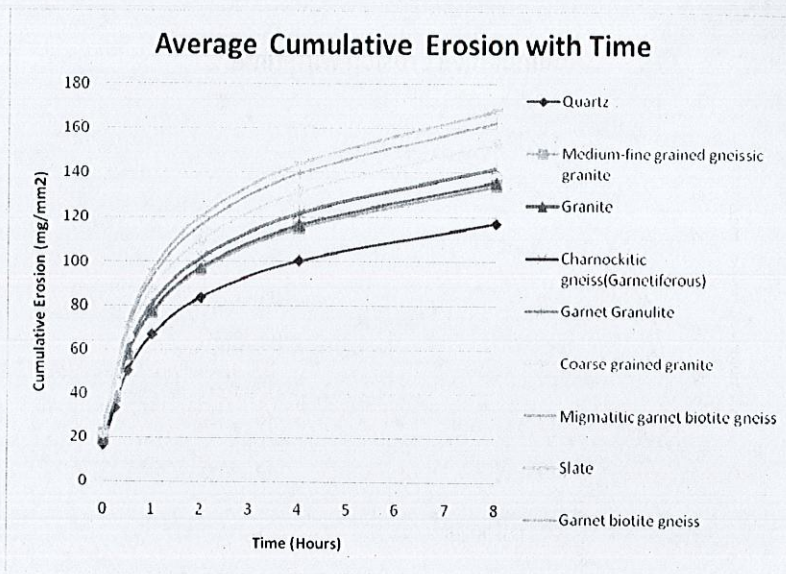


Figure 3: Average cumulative erosion of all tested samples.

Conclusions

This study indicates the possibility of applying this cheaper slurry erosive pot tester method to distinguish the resistance to erosion between different natural flooring materials. The medium to fine-grained granitic gneiss shows the least erosion and the highest resistance to erosive wear compared to the other materials tested in this study. Hence this study suggests the medium to fine-grained granitic gneiss having a higher durability is the most suitable as flooring material considering its durability aspects.

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References

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