TEST ON ACCELERATE ABRASION
AND CHEMICAL MOBILIZATION OF ROCKS *

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Résumé

Les auteurs présentent les résultats obtenus au cours d'un essai d'abrasion accélérée et d'altération chimique des roches. Le dispositif employé est un système rotatif mettant en jeu quatre étagères supportant des flacons parallélépipédiques en polyéthylène. Dans ces flacons, contenant un volume connu d'eau distillée, on y immerge des échantillons des principales roches ignées, en fragments de granulométries semblables. Les auteurs ont étudié le comportement éventuel de ces roches : 1°) lors de leur emploi dans les fondations des revêtements de routes et d'aérodromes, et 2°) dans le cas de grandes excavations dans des massifs rocheux où pénétreraient largement l'eau et l'air avec leur action agressive.

Abstract

The alteration and the alterability of rocks are estimated by wearing by friction, rolling and fragmentation accomplished by means of interpercussion of various types of rocks, as well as their aptitude to liberate the main chemical elements of the minerals of which they are composed. A rotative system device with parallelepiped polyethylene containers is used. From the results obtained some geotechnical considerations are intended.

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I - LABORATORY TEST PROCEDURE

This investigation was undertaken, within a planned study of the alteration and the alterability of rocks, to estimate the wearing, by friction, rolling and fragmentation accomplished by means of interpercussion, of various types of rocks, as well as their aptitude to liberate the main chemical elements of the minerals of which they are composed.

In this investigation we used a rotative system device comprehending four shelves on which were set parallelepiped polyethylene containers (Fig. 1). Into these containers a certain volume of distilled water was poured, and some fragments of identical granulometry related to the main types of igneous rocks (granites, nepheline syenite, diorites, dolerites, basalts, and so on) were immersed. In similar containers, equally filled with the same type and volume of distilled water substantially identical weights, the samples of rocks, with the same average sizes ($\varnothing = 35$ mm), were introduced.

The test was undertaken in three different cycles, during which the system, rotating at a speed of 22 r.p.m., was not stopped. The periods of time for each cycle were respectively 100h, 500h and 1500h. Before each cycle the immersion liquid was renewed and the test materials cleaned from muds and tiny fragments which were kept for examination.

The rotative system enables wearing of the rock fragments by rolling and friction, and also by percussion, as the containers are parallelepipeds with square bases. The fragments roll and interfriction along the walls, the rolling being syncopated, thus causing four impacts per rotation. In this manner we are able to obtain friction and percussion. Furthermore the tests are accomplished in an aqueous solution, thus enabling the investigation of the aptitude for chemical interchange of rock - water system. The renewal of the test water prevents the reduction of attack capacity of the liquid or an attack by a strongly alkaline solution.

As the test rocks were silicated rocks, mainly quartz-feldspathic or just feldspathic or else feldspar-feldspathic, the water of each cycle, after percolation, was tested for silica and $\text{K}^+$, $\text{Na}^+$ cations. The proportions of chemical elements found in the distilled waters, are given in Table I.

The loss of weight by the test fragments, after elimination of the muds derived from the wearing process was also tabulated. The gradual development of the test rock is given in Fig. 2.

The test was also meant to investigate the granulometry of the resulting residua. Therefore, the cumulative and frequency granulometric diagrams of Fig. 3 and 4 were worked out.