



Relationship between Los Angeles attrition test and Nordic abrasion test of volcanic rocks

Kateřina Krutilová and Richard Prikryl

Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Sciences, Charles University in Prague, Prague, Czech Republic

Various volcanic rocks contribute significantly to the production of crushed stone in the Czech Republic. When used for road surfacing, results of Los Angeles attrition test (LA value below 25 or 30 depending on the mode of use) together with polished stone value are required. In the recent study, we have focused on the search for possible correlation between results obtained by Los Angeles attrition test and Nordic abrasion test, a test widely employed in Scandinavia. For the experimental study, a set of volcanic rocks from 36 active quarries was used. The rocks under study represent range of volcanic rocks from ultrabasic to acid members, formed from Neoproterozoic to Tertiary.

The most favourable results of Los Angeles attrition test (i.e. the lowest LA values) were obtained for basalts (range of values 9.4-19.4) and spilites (range of values 8.4-14.9) which are in fact Neoproterozoic to Late Palaeozoic basalts affected by low grade metamorphism. Nordic abrasion test exhibited much broader range of values (6.4 to 36.9) with average value at 15.2 for basalts, resulting in weak coefficient of determination (0.19). On contrary, narrow range of values from Nordic abrasion test of spilites (7.2-15.9), very similar to the range of LA values, is reflected in higher coefficient of determination (0.56). On contrary, the least favourable properties (LA values 12.3-29.2, Nordic abrasion 16.8-43.3) have been observed for a group of basic to intermediate rocks classified in older literature as melaphyres and diabases (ranging from basalts to trachyandesites and/or trachybasalts) of Palaeozoic age. However, in this specific group of volcanic rocks, the highest coefficient of determination (0.89) between both tests has been achieved. For volcanic rocks exhibiting acid composition (rhyolites and quartz porphyry), coefficient of determination between LA values (15.1-19.3) and Nordic abrasion test (7.3-21.9) is weak (0.42). The weakest relationship between LA values (14.9-23.8) and Nordic abrasion test results (14.2-17.6) have been observed for group of phonolites, with value of coefficient of determination 0.12.

Despite the similar principle of both test methods (i.e. the mechanism of deterioration of aggregate particles during the test), the results seem to be variable for rocks of similar mode of formation. The differences between individual groups of volcanic rocks can be partially explained by variable rock macro- and microfabrics that significantly affect their rock physical properties.