SUMMARY

The alkali-silica reaction is one of the most damaging chemical reactions taking place in concrete, which can cause fatal damage. ASR originates under following conditions: high moisture (> 80 %), sufficient amount of alkaline ions (Ca^{2+}, Na^{+}, K^{+}) and use of reactive aggregates (low crystaline or deformed quartz, amorphous SiO_2). Reactive aggretates react with high alkaline pore solution and produce hydrofile gels. These gels absorb water and swell. Dilatometric test methods are commonly used to evaluate the reactivity of aggregates. The principle of dilatometric test methods is simple. Mortar or concrete prisms are created in a laboratory, then they are stored in the special environment, which accelerates the inception of ASR. The creation and expansion of alkali-silica gels cause prism's length changes. The major goal of this diploma thesis was to evaluate the alkali-silica reactivity potential of quartz-rich rocks using microscopic (polarizing microscopy, scanning electron microscopy combined with SEM/BSE image analysis) and dilatometric (ASTM C1260, RILEM AAR-4.1) methods. Rocks were assessed as reactive, potentially reactive and non-reactive by the ASTM C1260 method. The reactivity of aggregates was connected with the amount of cryptocrystaline matrix, grain size, shape of grain boundaries, subgrains and undulose extinction of quartz. Rocks with the highest reactivity potential contained up to 25 % volume of cryptocrystaline matrix, and subgrains. Rocks with the lowest reactivity potential contained only undulose extincting quartz grains and few subgrains. RILEM AAR-4.1 was only supplementary method to ASTM C1260. RILEM AAR-4.1 was a suitable test method for evaulation of slowly reactive aggregates. SEM/BSE image analysis was used to quantify damage caused by ASR in mortar test prisms (ASTM C1260). ASR caused extension of natural geological and brittle cracks and dissolution of cryptocrystaline matrix. Rocks with the highest reactivity potential and high content of matrix were more damaged by ASR (6.3-8.1 vol. %) than rocks with lower reactivity potential. Modified version of SEM/BSE image analysis was applied on polymineral rock (quartzite) with satisfactory result. Modified SEM/BSE image analysis truly evaluated the damage of quartz and feldspars caused by ASR.