Summary

This diploma thesis is focused on the finding and describing of the relationships between petrological parameters and technological properties of rocks used for the production of aggregates (crushed stone). Rock specimens were selected from a geological area of Culm (Lower Carboniferous age) in the area of Nízký Jeseník Mts. and Drahanská vrchovina uplands in the Czech Republic. Studied localities were selected on the basis of the current quarrying operations and also to represent the different strata. The six studied localities encompass Kobylí, Chabičov, and Bělkovice where Horní Benešov formation of Nízký Jeseník is exposed. Locality Valšov represents Andělské Hory formation and locality Nová Ves and Loštice represent Protivanov formation of Drahanská vrchovina uplands. Two specimens were taken from the locality Loštice (one from the second cut because there are produced low-grade aggregates and the third cut where high quality crushed stone is produced).

A detailed mineralogical-petrographic examination of the samples was the first step, in an attempt to obtain their mineralogical composition and to identify the major rock-forming clasts. Thin sections were examined by standard polarizing microscopy. The auxiliary UV lamp and thin sections saturated by fluorescent substance were used for the examination of pore spaces. It has been found, that the studied rocks are composed by subangular and angular grains of quartz, fragments of stable rocks (predominance of quartzites), unstable lithic fragments (phylites, metaphylites, siltstones, slates, greywackes, and less frequently acid eruptive rocks), feldspars (orthoclas, microcline, plagioclase), and detrital micas. Detrital and authigenic chlorite has been found as well. The matrix was defined as interclast space which is composed of a mixture of sericite, chlorite, clay minerals, cements, and clasts in aleuropelitic size. Matrix represents the largest volume of rock-forming components in all of the studied specimens. Based on the microscopic description, all specimens were classified as greywacke with fine to medium grade and massive structure. Only specimen from Bělkovice has shown partly layered structure. All studied specimens show signs of diagenetic environment. The alterations of feldspar and unstable rock fragments were the most common. These altered grains were disintegrated into their matrix. It was also reported pressure dissolution of quartz clasts and the formation of siliceous and calcite cements.

The petrographic image analysis was used to identify and quantify microstructural characteristics of the studied rocks. A hand drawn picture of grains boundaries was obtained from the microphotographs. During quantitative microstructural analysis, the following parameters were measured: area, perimeter, slope and length of major and minor axes of clastic grains. These measured data serve for computations of fabric parameters as grain size, degree of sorting, and other geometric parameters (shape factor, compactness, and aspect ratio). The method used in this study expresses grain size as the diameter of the circle of the equivalent area as it is occupied by analyzed grain. Quantified results of micrustructural parameters of the studied rocks were then correlated with the petrological and technological values. The coefficient of correlation was determined for each relationship.

According to the obtained results it is evident that the average size of clasts and volume of matrix are the main factors affecting the LA values (Los Angeles abrasion test) in the greywacke lithology. The LA values decrease (i.e. show better performance of the material) with the increasing of volume of matrix ($R = 0.61$) and with decreasing average grain size ($R = 0.44$). The degree of sorting has a large influence as well. More graded greywackes have higher values of LA. Another significant technological value of PSV has shown the highest dependence when is compared with the volume proportion of quartz clasts. The increasing volume of quartz clasts seems to have positive influence on PSV (Polished Stone Value). None of the other studied petrographical and microstructural parameters seems to influence technological properties of examined greywackes.