Emulsion explosives (EEs) are the most recently developed group of explosives for civil uses. EEs are available as two types of products: cartridged EE and bulk EE. The cartridged product has the form of foil cartridges with a specified weight, diameter and length. The bulk EE consists of two non-explosive components. The actual explosive is only created after they have been mixed and a certain period of time has passed. The main advantage of bulk EE is its safety during production, transport and use. The drawbacks of EEs are lower detonation parameters than for cartridged EEs or traditional nitroester explosives – dynmites, as well as the dependence of detonation parameters on temperature and the interval between loading the boreholes and initiating them.

The aim of the research was to develop a new EE formulation that will exhibit: (1) increased detonation parameters, particularly for blasting operations in hard rocks and at varying rock temperatures; (2) lower emission of post-detonation gases.

The research involved a review of existing literature, so as to determine the most promising avenues for modifying bulk EE formulations, and a sequence of experimental studies, so as to verify the veracity of the adopted assumptions. The sequence of studies included:

- Investigation of changes of the detonation parameters of the existing EE formulation over time;
- Study of the influence of aluminium addition on the parameters of the existing EE formulation;
- Study of the course of the EE sensitisation process on a laboratory scale and in the expected use conditions, as well as investigation of the viability of modifying the course of sensitisation;
- Developing a new sensitising agent composition, ensuring: (1) rapid sensitisation after the EE components are mixed, followed by only minimal changes to its properties over time; (2) increased detonation parameters of the EE; (3) lowering the emission of post-detonation gases;
- Study of detoneation parameters of the new EE formulation on a labroatory scale and in prospective use conditions.

Laboratory-scale results indicate that the new formulation exhibits increased parameters when compared with Emulinit 8L. Consequently, all assumptions of the research have been fulfilled.

In prospective use conditions, the static mixer, which is dedicated to the standard sensitising agent, was found to be problematic (inadequate mixing of the components was achieved). Despite this, the BK2 formulation in some cases exceeded the performance of the existing formulation. The main advantage of BK2 over Emulinit 8L was that the BK2 formulation was sufficiently sensitised after only 10 minutes, whereas Emulinit 8L achieved a similar sufficient density after approx. 40 minutes, with the sensitisation process continuing. Laboratory research showed, that the sensitsation of Emulinit 8L only slowed down after several hours. The developed material fulfills all technical requirements and, pending the modification of the static mixer, can successfully replace the existing Emulinit 8L formulation.