Geophysical Research Abstracts
Vol. 16, EGU2014-2227-1, 2014
EGU General Assembly 2014

Permittivity Investigations of the Road Construction Raw Materials for Purposes of GPR Data Interpretations

Lech Krysiński
Road and Bridge Research Institute, Warsaw, Poland (lkrysinski@ibdim.edu.pl)

Permittivity is the major material property governing the formation of GPR response signal in diagnostic measurements. Every quantitative interpretation refers explicitly or implicitly to discussion of permittivity values. Thus, the recognition of permittivity for materials typical of the given technological area is necessary to make use of diagnostic measurements.
Collection of several tens of stone cores representing different outcrops was investigated in order to obtain cross-sectional view of permittivity for stone materials being in use in Polish road construction industry as components of stone-asphalt mixtures. The main task was to estimate the typical permittivity values for stone materials treated as representation of several major petrological types. The capacimetry (at 50 MHz) was used as major and very efficient method of permittivity assessment and formation of the samples was subordinated to demands of this method. This method allows for determination of permittivity variability on the lateral surface of the cylindrical sample, giving the insight into the major features of the permittivity spatial distribution characteristic for the given rock. For the most homogeneous samples (in terms of permittivity distribution) the permittivity was measured also on the core top at frequency 2 GHz using impulse GPR reflectometry. No clear proofs for considerable permittivity frequency dependence were found (in the frame of the two methods precision) for these rocks. This conclusion can be related generally to major rock-forming minerals at least in dry igneous rocks.
Only solid rocks obtained from regular massive outcrops were included to this first cross-sectional sampling, while artificial synthetic materials and natural gravels of postglacial origin were omitted since additional problems occur in these cases. This first experience allowed to recognize practical problems related to the sampling procedure. The collected data allow for provisional identification of the major rock component type in stone-asphalt mixture on the base of the pavement reflection amplitude. More precise considerations need use of the assumed recipe of the mixture, because the stone fraction usually consists of several different rock types.
The direction and development of these efforts were inspired by discussions and activities in the frame of the COST Action TU1208 "Civil engineering applications of ground penetrating radar" and research was supported by Road and Bridge Research Institute (PW.S-647).