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Monitoring Coal Ash Variations in the National Road No. 2 (Jisr-el-Zarqa) Road Interchange Embankments - Chemical and Mineralogical

Aspects

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Abstract

Results of the third monitoring of the areas to the embankments of National Road No. 2 (Jisr-ez-Zarqa) are reported herein. The northern "bridge embankment" is built mainly of homogeneous fly ash, whereas the fill of the southern "road embankment" consists mainly of bottom ash with lesser amounts of local earth material. This compositional difference is noted in the adsorbed water content (AWC - water released at < 105°C): the "road embankment" exhibits a bimodal behavior while the AWC for the "bridge embankment" is nearly constant. Fly ash retains a higher level of AWC than bottom ash or the local earth, and thus its concentration in the "road embankment" is significantly lower than that of the "bridge embankment". If the AWC is an indicator of chemical-mineralogical activity, then theoretically, this activity should be more intense in the "bridge embankment". However, since fly ash has pozzolanic features, water results in a hardening of the ash and a decrease in its activity.

In a study of the ratio between chemical concentrations versus depth in the three two sampling stages, it is clearly noted that there were no significant changes in the chemical composition of the coal ash filling of the embankments. This is true for both the "road embankment" which consists mainly of bottom ash, and for the "bridge embankment" which is composed of fly ash and is considered to be more problematic.

As reported in previous reports, a new crystallographic phase not present in coal ash or local earth material was detected by X-ray Diffraction. This phase was defined as stilpnomelane - $(\text{Fe,Mg})_6(\text{Si,Al})_8\text{O}_{19}(\text{OH})_9$. The contents of this phase are higher in the "bridge embankment" which is presumably more active chemically, with a normalized peak intensity of 30 (arbitrary units) as compared to 10 in the road embankment. There is no indication of a change in the stilpnomelane content with time.

Extraction experiments using the TCLP test indicate that most of the measured elements are difficult to extract with the exception of Mo, B and Se. Mo and Se concentrations in coal ash are low, and the only element that may be extracted in considerable amounts is boron (B).