

“PAHs Behaviour associated to coal mining environments”

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ABSTRACT

This study attempts to determine the liberation and behaviour of certain organic compounds from the structure of coal, depending on the characteristics of the water that gets in contact with it, operating at a coal spoil pit located in Asturias, northern Spain.

The contaminants of concern at the site are the so-called PAHs (Polycyclic Aromatic Hydrocarbons), compounds that have proved to be toxic and carcinogenic for human health. The results were used for the characterization of the contamination at the coal spoil pit and for understanding the behaviour and transport processes of these PAHs depending on external factors (such as acid drainage, solubility in surface water, etc.).

The acid mine water at the coal spoil pit has two different origins: the sulphur from the pyrite in the coal composition and the acid mine water coming from a mercury mine located just uphill from the coal spoil pit.

Surface sampling techniques have been applied to obtain in successive sampling campaigns a series of samples (soil and surface water samples) representative of the coal spoil pit and its surroundings. All these samples were taken to the laboratory and were analyzed with different analytical techniques (Gas Chromatography/Mass Spectrometry and Infrared spectroscopy).

A series of experiments were performed at the laboratory to determine the behaviour of these contaminants: a sample of coal was put in contact with different kinds of water (taken at the coal spoil pit, both acidic and non-acidic; and fabricated at the laboratory, both acidic and neutral), and the obtained samples were analysed by HPLC.

The results from the sample analysis and from the experiments performed in the laboratory showed that the PAHs are liberated to the environment from the coal structure at the coal spoil pit, accumulating in different areas depending on the presence of acid mine water, on the inclination of the soil surface, on the accumulation of surface water in ponds, etc.

The results from the experiments carried out at the laboratory with coal samples in contact with different types of water showed that PAHs seem to be liberated from coal structure depending on the temperature of the test, on the acidity of water and on the presence of metals dissolved in that water. These metals seem to act as catalysers of the series reactions that take place in a series of batch reactors at a certain temperature used to perform the laboratory tests.