

Phytoremediation of spoil coal dumps in Western Donbass (Ukraine)

Iryna Klimkina (1), Mykola Kharytonov (2), Oliver Wiche (3), and Hermann Heilmeyer (3)

(1) National Mining University, Department of Ecology, Dnipropetrovsk, Ukraine (irina_klimkina@ukr.net), (2) Dnipropetrovsk State Agro-Economic University, Dnipro, Ukraine, (3) TU Bergakademie Freiberg, Germany

At the moment, in Ukraine about 150 thousand hectares of fertile land are occupied by spoil dumps. Moreover, this figure increases every year. According to the technology used about 1500 m³ of adjacent stratum is dumped at the surface per every 1000 tons of coal mined. Apart from land amortization, waste dumps drastically change the natural landscape and pollute air, soil and water sources as the result of water and wind erosion, as well as self-ignition processes.

A serious concern exists with respect to the Western Donbass coal mining region in Ukraine, where the coal extraction is made by the subsurface way and solid wastes are represented by both spoil dumps and wastes after coal processing.

Sulphides, mostly pyrite (up to 4% of waste material), are widely distributed in the waste heaps freshly removed due to coal mining in Western Donbass. The oxidation of pyrite with the presence of oxygen and water is accompanied by a sharp drop in the pH from the surface layer to the spoil dumps (from 5.2–6.2 to 3.9–4.2 in soil substrates with chernozem and from 8.3–8.4 to 6.7–7.2 in soil substrates with red-brown clay, stabilizing in dump material in both cases at 2.9–3.2). Low pH generates the transformation of a number of toxic metals and other elements present in waste rock (e.g. Fe, Al, Mn, Zn, Mo, Co, As, Cd, Bi, Pb, U) into mobile forms.

To stabilize and reduce metal mobility the most resistant plants that occur naturally in specified ecosystems can be used. On coal spoil dumps in Western Donbas the dominant species are *Bromopsis inermis*, subdominant *Artemisia austriaca*; widespread are also *Festuca* sp., *Lathyrus tuberosus*, *Inula* sp., *Calamagrostis epigeios*, *Lotus ucrainicus*, and *Vicia* sp.

Identification of plants tolerant to target metals is a key issue in phytotechnology for soil restoration. It is hypothesized that naturally occurring plants growing on coal spoil dumps can be candidates for phytostabilization, phytoextraction (phytoaccumulation) and phytomining techniques. Results on accumulation of target elements in the above- and below ground biomass of abundant plant species will be used to discuss their phytoremediation potential for spoil coal dumps in Western Donbas.

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