SUPPLEMENTARY MATERIAL

Predictive modelling of iron leaching from mining waste: Civil protection and environmental safety implications

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CHARACTERISTICS OF ROCK TYPES OF CHERVONOHRAD CONCENTRATION PLANT WASTE PILE

The average composition of the bulk mass of the studied spoil tips is as follows: argillites account for 65–75%, siltstones for about 20%, sandstones for 10–15%, and coal and carbonaceous rocks for 2%. In addition, carbonaceous material is present as coal inclusions in claystones and sometimes in siltstones. Technical analysis indicators range from: ash content – 65–98%, sulphur content – 2.5–3%, moisture – 3–5%. Claystones are coloured from dark grey to black, depending on the amount of humus and sapropel material that saturates them. The structure of argillites is pelitic. Grains of 0.01 mm predominate. The bulk of argillites is represented by clay minerals: hydromica (25–85%), kaolinite (4–60%) and partly chlorite (5%) and vermiculite (5%). Along with clayey material, different silica contents and a small amount of organic matter have been noted. In argillites enriched with quartz, the latter content is 1.5–20%. Pyrite has developed on plant remains in the form of single crystals and aggregates of microconcretions (Knysh, 2008; Knysh and Karabyn, 2014; Karabyn, Shtain and Popovych, 2018).

Table S1. Annual precipitation dynamics (2018–2024) at Volodymyr

Year	Precipitation (mm)	Volume (m^3)	Volume over 0.8638 km^2 (m^3)	Mass per m^2 (kg)	Mass over 0.8638 km^2 (kg)
2024	580.5	0.5805	501,435.9	580.5	501,435,900
2023	829.1	0.8291	716,176.6	829.1	716,176,600
2022	582.5	0.5825	503,163.5	582.5	503,163,500
2021	511.4	0.5114	441,747.3	511.4	441,747,300
2020	558.7	0.5587	482,474.1	558.7	482,474,100
2019	540.8	0.5408	466,976.0	540.8	466,976,000
2018	652.5	0.6525	563,479.3	652.5	563,479,300

Source: own elaboration based on Meteopost (2025).

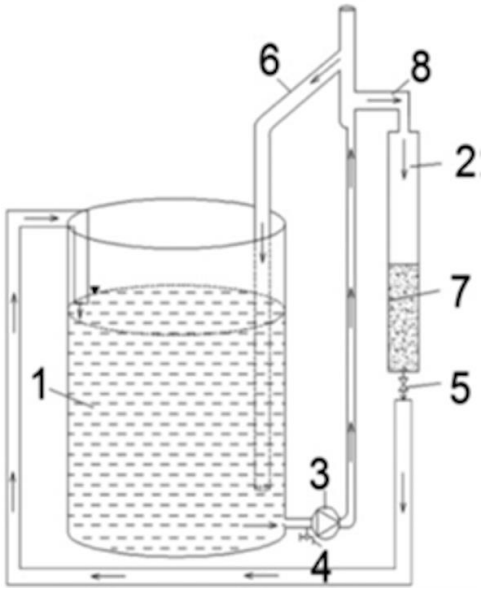

Fig. S1. Experimental stand scheme; *1* = tank for deionised water, *2* = filtration column, *3* = feed pump, *4* = sampling point (before filtration), *5* = filtrate outlet, *6* = overflow pipe, *7* = filter material (argillite), *8* = deionised-water distribution pipe to the column; source: Stepova *et al*. (2023) modified

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