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TOXIC COMPOUNDS GENERATED BY METALWORKING FLUIDS AND ALUMINUM SLAG LANDFILL AND THEIR EFFECTS ON ENVIRONMENT AND PEOPLE

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Abstract

This paper presents an assessment of the toxic compounds released from metalworking fluids (MWFs) used in aluminum solid waste processing and from aluminum slag landfills, and their impact on environmental quality and human health. The mean concentrations of dust, oil mist, aldehydes, volatile organic compounds (VOCs) released from metalworking fluids were determined in machine shops. The exposure in machine shops was quantitatively dominated by VOCs, whose concentrations varied in the range 0.75 to 3.25 mg/m³, while the maximum levels of 1.54, 0.583 and 0.208 mg/m³ was found for dust, oil and aldehydes, respectively. The measurements achieved with aluminum slag showed that, when this waste is deposited in landfills, it becomes hazardous to the environment and people by generating undesirable heat, liquid leachate containing heavy metals, toxic and bad smelling gases such as ammonia, phosphine, hydrogen sulfide or flammable gases such as hydrogen and methane. The methane concentration was about 4 vol.%, whereas hydrogen concentration about 70 vol.%. The concentration of ammonia was about 27 vol.%, whereas phosphine concentrations were less than 1%vol. Hydrogen sulphide was detected only in odour threshold gas, but enough to develop bad odor. Temperature in system after 14 days of investigations reached the value of 63°C. All gases formed within a landfill left it, driven either by differential pressure or by concentration gradients. Gas transport processes also include spontaneous gas exchange over the landfill perimeter. The effects of toxic chemical compounds on environment and people health are discussed.

Key words: aluminum slag landfill, environment effect, metalworking fluid, people health risk, toxic compound

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