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Sonic drilling: evaluation of the best techniques for tailings and mining waste exploration and valorization

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Sonic Drilling is an advanced form of drilling that employs the use of high frequency resonant energy to advance a barrel or casing in underground formations. During drilling, the resonant energy is transferred by the drill head to the drill string at various sonic frequencies. The main advantages are: high performance and high recovery rates in poorly consolidated or fractured material such boulders, sand and heterogeneous material; dry drilling or with low water content; minimization of drilling discard: about 70% less discard compared to traditional drilling; straight holes with minimum deviation; up to 4 times faster compared to traditional drilling; big core diameters.

Most of the current applications are related to exploration drilling, for example: titanium exploration in sands; lithiums exploration in salars; bauxite, kaolin, uranium, REE (Rare Earth elements) in clays. Other relevant applications are related to the characterization of heterogeneous material present in tailing dams, stock and waste pile. Actually this technique is mostly used in Australia, USA, Canada, Brazil, Chile, and in few European countries (Orberger et al., 2018, 2019; González-Díaz et al., 2022, Santos et al., 2022) and it is innovative for mining dumps exploration.

In addition the main goal of Europe Commission highlighted in recent Critical Raw Material Act is to investigate the potential for recovery of critical raw materials not only from extractive waste in current mining activities but also from historical mining waste sites. For all the above mentioned reasons this technique could be a interesting opportunity of exploration with the objective of circular economy in the mining sector.

The research aim to give an overview of the exploration activities by means sonic drilling of Horizonte Mineiro Serviços Geológicos Ltda, in Brazil in order to select the best technologies to be used for the mining tailing storage facilities and waste rock dumps in Europe.

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