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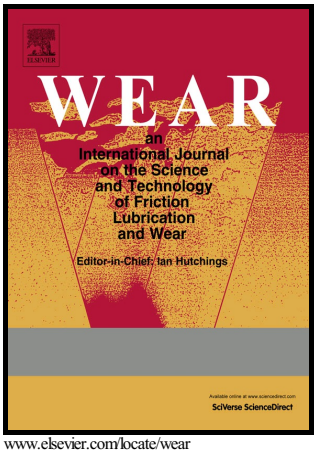

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The influence of microstructure on abrasive wear resistance of selected cemented carbide grades operating as cutting tools in dry and foam conditioned soil.

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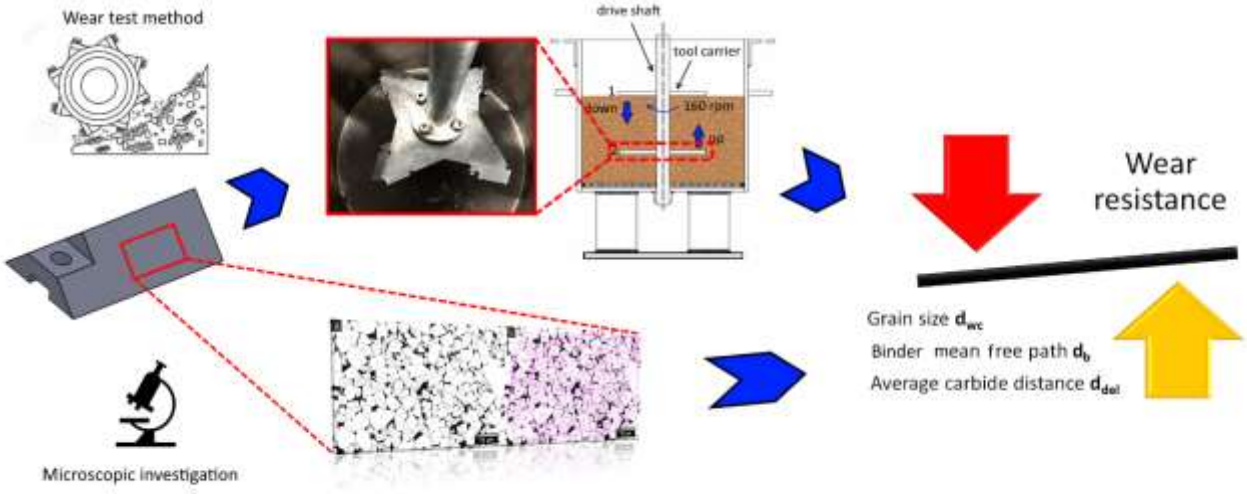
Abstract

WC cemented carbides are used extensively as cutting and drilling tools in the cutter heads of the full face Tunneling Boring Machines (TBMs).
This paper describes the effects of microstructural properties of selected cemented carbide grades, operating as cutting tools in dry and foam conditioned soil, towards abrasive wear resistance. The work was carried out with the purpose of identifying the most promising cemented carbide microstructural formulation against abrasive wear and of defining the possible changes induced on the wear mechanisms by conditioning agents.
Microstructures of six commercial grades of cemented carbides with different Co content and WC grain size were characterized. The wear tests were carried out using a testing device simulating the working environment of TBM cutter heads both in dry and conditioned soil.
According to all experimental findings, wear resistance of the investigated cemented carbides strongly decreases as the grain size and mean binder free path increase, regardless of the test conditions. Furthermore, the carbides distribution, hereinafter called *Delaunay distance*, plays a crucial role on wear behavior, having a linear relation with the specific volume loss. Moreover, the optimal microstructural features to promote wear resistance are here described. Finally, foam conditioning of soils was found to strongly influence the wear resistance, by reducing binder ploughing and WC microcracking.

Graphical Abstract



Keywords

WC-Co cemented carbides
Abrasive wear resistance
Wear mechanisms
Microstructural of WC-Co
Tunnel Boring Machines
Cutting tools