

## conference proceedings - PDAC 2011

### **Polymetallic black shales: Mega-deposits of the future An explorationist's perspective on an "old" deposit type that's finally "new"**

Prospectors and Developers Association of Canada Convention, S.F.Sabag MSc PGeo, President, DNI Metals Inc., Mar 2011

Polymetallic black shales are an emerging deposit type which has gained prominence over the past decade as an immense, future, long-term source to metals, Uranium and hydrocarbons.

Exploitation of polymetallic black shales has historically been challenged by: morphology of the metalbearing compounds typically dispersed as very fine particles "physically" trapped in organic and clay fractions or in slimes; and by the inefficiency, the environmental impact and high energy costs of conventional metals recovery processes.

Recent milestone advances in bulk bioleaching, given its ability to treat lower grade ores at relatively low cost and impact, have propelled this novel deposit type to the frontlines worldwide as a realistic future source of metals.

Successful exploitation of polymetallic black shales is more a function of logistical than technical criteria. Only those deposits which are favorably located without a competing land use, are near infrastructure and are accessible to bulk-mining, offer realistic exploration targets.

Black shale hosted polymetallic deposits are typically associated with other deposits or mining camps, often with an affinity to large metal-bearing geological systems. Two types of metal enrichment have been recognized, contrasted by mineralogy, trace geochemistry, geometry/extent of mineralization and geotectonic setting: thin (mm-cm) high grade (5%-10%+) "Rift Type", associated with intracontinental rifting without intrusive rocks; and thicker (20 m-100 m) modest low-grade (tens-hundreds ppm) "Rift-Volcanic Type", forming tabular 1+ billion tonne deposits extending over tens-hundreds km<sup>2</sup>, associated with intracontinental rifting and basic volcanism in oceanic crust, likely controlled by submarine exhalations in the presence of organic matter.

There are currently only three active polymetallic black shale projects worldwide: 1) The Talvivaara mine in Finland, with a 1+ billion tonne resource base, has been in production since 2008, by Talvivaara Mining Company Plc, and is the first ever mining operation collectively recovering Ni-Co-Cu-Zn-(Mn)-(U) by bioheapleaching polymetallic black shale; 2) Continental Precious Minerals Inc. recently released an Economic Study for a portion of its 1+ billion tonne resource base at its Viken deposit in Sweden, hosted in Alum Shale, focusing on extraction of Mo-U-V; and 3) DNI Metals Inc. has been advancing its six 100-300 km<sup>2</sup> polymetallic systems in the Second White Speckled Shale, Alberta, since 2008, and is commencing drilling to classify/upgrade two potential mineral deposits, including 1+ billion short tons over 26 km<sup>2</sup> DNI has demonstrated suitability of bioleaching to extraction of Mo-Ni-U-V-Zn-Cu-Co-Ag-Li from its shale.

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