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Mineralogical and geochemical characterization of riverbeds sediments in the Southern part of Chile

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As in any productive activity, the exploitation of mining resources produces negative impacts on three elements in the Environment: the water, atmosphere and soil. Although the handcrafted mining industry intensively uses the pollutant elements mercury and cyanide, these total quantities are comparatively similar to those employed and spilled into the environment for dredging and re-washing by industrial plants in the traditional mining industry. The environmental impact of the handcrafted mining industry is widely dispersed among many small operations, and this impedes the application of preventive or corrective measures, due the inconvenient locations of these facilities in both urban areas with high population densities as well as in rural areas. The pollution levels in the case of the handcrafted mining industry, in spite of their minor production levels and possessing lesser quantities of equipment, prove to have in many cases high repercussions in the ecosystem, and this fundamentally takes root in the great number of pollutants involved.

Large quantities of water contaminate with toxic sludge, especially in the exploitation of placers in recent riverbeds and river mouths of lakes and tidelands. Subsequent purification of the water is not generally carried out. The suspended sediment causes lasting detectable alterations more than 30 km downstream. On the one hand the quality of the water destined for human consumption, especially in valleys which is gathered directly from the river, is strongly damaged because it is not submitted to purification

processes. On the other hand, a change or annihilation of the original fauna and flora from the river is caused by the alteration of its aquatic environment. This brings negative consequences not only upon fishermen but also for the animal protein food supply. The pollutant elements enter the biological cycle, producing irreparable damage.

In the Southern part of Chile, with a mild and rainy climate, high levels of heavy metals have been detected in many gold placer deposits, many of them contaminants, which risks human life and as a consequence, damage the trofic chain of this environment.

The study zones selected correspond to the handcrafted washers of Río Gato (41º19´ to 41º32´S and 73º20´ to 73º45´W, Los Muermos), Carelmapu (41º44´35´´S and 73º44´17´´W), and Cucao (42º39´08´´S and 74º07´12´´ W, Isla Grande de Chiloé). These are all located in the X Region of "Los Lagos" in Chile.

The type of methodology used in the characterization of the associated mineralization consists of testing each representative sample to a grain size distribution, statistical parameters analysis and a mineralogical analysis using a binocular magnifying glass, a petrographic microscope and SEM/EDX. The chemical compound has been defined by means of X ray fluorescence and micro-chemical analysis.

The results of the study about sediments in the Southern part of Chile are presented. In general terms, the major concentrations of heavy minerals are located in zones of dynamic river energy. In samples more than 70% of the heavy minerals is distributed among grain sizes corresponding to thin sand with good grain selection (meshes of 0.25-0.06 mm).

The main heavy metals found as a result of the study are mercury, lead, cadmium, chrome, tellurium, indium, zinc, iridium, palladium, zirconium, rubidium, tin, cobalt, copper, platinum and gold, and as well some less common elements such as cerium, praseodymium, gadolinium, neodymium, samarium and lanthanum.

Heavy metals, minerals and their classification are an important part of this research paper.