

Novel applications of geochemistry to mineral exploration and remediation

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Mineral deposits are in fact geochemical anomalies, and as such their detection and assessment of their impact on the environment should be facilitated using geochemical techniques. Although geochemistry has been used directly in the discovery of mineral deposits and more indirectly in shaping deposit models, much of the novel application of geochemistry is in formulating effective exploration and remediation strategies. Areas where recent research, application and policy intersect in the extraction of metals from the geosphere include: (1) the use of element mobility in the near surface environment to detect deposits at depth, (2) revealing element distributions in and around deposits to adequately assess the total chemical environment associated with the deposit and to refine effective and relatively benign extraction and waste disposal techniques, (3) understand the effects of both macro- and micro-environments on element mobility across the geosphere-biosphere interface to define appropriate remediation techniques associated with the extraction of diverse commodities. Research, both pure and applied, play a fundamental role in providing the techniques for these areas, but this is driven largely by what industry requires, which is driven largely by policies formulated in government agencies. Research in applied geochemistry can add value to exploration and remediation strategies provided the results are adequately conveyed to the appropriate individuals in both industry and government and there is a perceived need to develop new and novel techniques by all concerned. For example, the application of isotope tracing to elucidate the processes by which various elements move through the geosphere and into the biosphere is a novel area of research with boundless potential for exploration and remediation. This area, which is largely driven by those in research, is an evolving one wherein the historically high costs, slow turnover and general mystic are being overcome by a concerted need by all involved to better understand the processes mining has on the total environment.