Preface

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Biographical notes: Kostas A. Matis had his First Degree in Chemistry in the Department where he is currently working. He obtained his MSc and PhD on December 1977 in the (then) Chemical Engineering Department, University of Newcastle upon Tyne, UK. His main field of specialisation is separation science and technology (mainly flotation), other fields being wastewater treatment, environmental biotechnology, inorganic materials and mineral processing. He is the author of about 120 papers in refereed journals that received more than 1500 citations, three patents, ~50 communications to scientific meetings and also an editor of four books.

Fresh water is usually thought of being abundant and easily accessible; in reality, it seems that less and less water is available for the needs of an increasing world population, and a considerable disparity exists between the amounts of water available for the developed world and for the developing or under-developed countries. In addition to the potential shortage of water, another severe problem is the pollution of available fresh water streams (sources, resources) by various undesirable substances some of which, e.g., the heavy metal ions, are toxic for humans through the food-chain pyramid.

In some cases, these substances are unfortunately natural constituents and pollution of these streams seems to have happened accidentally, but in most cases, the presence of metal ions is the result of a certain human activity, industrial, agricultural or household; toxicity depends on many chemical and physical parameters of the metals solution including their aqueous speciation. However, several metals as copper, zinc, cobalt are essential for living organisms in trace quantities. Further, as new economy activities are in fact surprisingly dependent on traditional raw materials (a PC typically contains ~30 mineral ingredients), metals recovery except separation is of great significance.

National and international legislation – i.e., the principle of sustainable development – enforces the treatment of these streams to remove the noxious components and different techniques have been developed to achieve this. The conventional processes to treat this kind of water have disadvantages frequently, such as the following: high use of treatment chemicals, large quantities of sludge produced, inadequate selectivity, slow kinetics, low capacity, fouling and scaling problems, cost-ineffective, and mainly to address these reasons, research is going on. There is also currently a trend to apply combined or hybrid treatment for this case.

Among the separation processes investigated at present are: precipitation, coagulation, cementation, flotation (including electroflotation), membrane processes,

sorption and biosorption; for the latter, nanostructured materials and also non-conventional adsorbents were examined. Emphasis has been given particularly to metal ions such as lead, cadmium, copper, nickel, zinc, arsenic and chromium. Twenty-six papers were submitted to the guest editor in this special issue coming from various countries, from Canada, throughout the European Union, to India, China, Australia and New Zealand (in total 15).