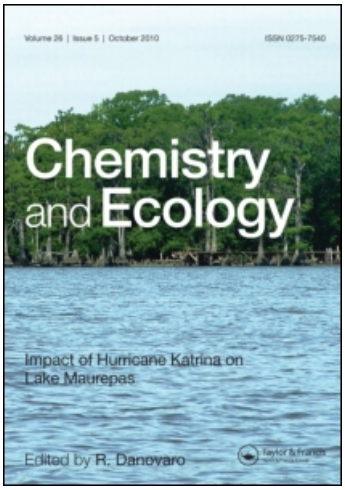

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Preface

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PREFACE

The 2IOPS Symposium, held at Quinghua University, Beijing, China, 4–8 October, 1993, provided an opportunity for workers on use of waste material for artificial reef construction around the world to meet together since the Fifth International Conference on Artificial Habitats for Fisheries, 3–7 Nov., 1991 at Long Beach, California, USA.

Artificial reefs have been built around the world for fishery enhancement. Whilst materials such as rock or concrete and steel have been used on a large scale they are expensive. Waste materials can provide a cheaper source. Large solid waste items have been used including ships, cars, tyres and construction rubble. Finely divided materials such as coal ash can be stabilised with cement to produce marine construction materials. The reducing availability and increasing cost of land disposal are further factors influencing the use of waste materials in the sea.

Most stabilisation studies have been undertaken using coal ash, including pulverised fuel ash (PFA) and flue gas desulphurisation (FGD) sludge containing gypsum. These were pioneered in New York in the late 70's leading to the Coal Waste Artificial Reef Programme (CWARP). In addition to addressing the engineering problems posed by the effect of sea water on solidified ash in sea water, this group laid the foundations for full environmental impact studies, monitoring the block strength and chemistry, biological colonisation of the material and evidence of bioaccumulation in the reef associated biota. Studies in Southampton, UK and Genova, Italy, have followed this approach closely. Shortly after the Beijing Symposium, an experimental coal ash reef was also deployed in Hong Kong by a group with similar aims. In the USA, further studies with stabilised coal ash concentrating on biological aspects have been undertaken in Delaware and Cedar Key, Florida. Coal ash combined with calcium carbonate residues has been studied in the Bohai Sea, China. The largest scale experiments have taken place in Japan and Taiwan, where high structural strength of stabilised coal ash has been achieved enabling the construction of complex structures as opposed to the simple blocks used in the other studies above. There are ambitious plans in both countries to scale up the experiments for full scale utilisation of the output of all ash from coal-fired power stations. The most exciting is the sea mount concept from Japan to build structures in deep water so as to cause upwelling of nutrient rich sea water.

Some experiments with oil ash stabilisation have been undertaken in Florida along similar lines to the coal ash studies. In New York, work has now been extended to the use of stabilised municipal waste incinerator ash. This latter material is also the subject of research in Florida and Bermuda.

Apart from the sharing of scientific information, the Symposium provided an opportunity to discuss the political and social constraints on this use of waste material.

The principal international legislation covering the deposition of waste and other matter in the ocean is the London Convention, 1992 (formerly the London Dumping Convention). Placement of material for the construction of artificial reefs is not covered by the Convention. However, aware of the range of materials that have been used for such purposes, the LC Scientific Group has recommended that the

guidance prepared for the interpretation of the Annexes to the Convention in relation to dumping at sea contains all the considerations that are needed for the assessment of placement of an artificial reef or structure. The newly revised regional OSPAR (Oslo/Paris) Convention, covering the north east Atlantic area, includes placement of matter such as ashes for the construction of artificial reefs within its purview and is establishing a set of technical guidelines for the practice.

There are very vocal government representatives and non-governmental organisations who do not differentiate between types of waste and want to prohibit the placing of any type of waste material in the sea. A consequence of such blanket bans could lead to problems elsewhere. One of the themes emerging from the Symposium as a whole was the concern over sectoral distribution of wastes. If no waste materials are disposed to the oceans after 1995 as prescribed by the London Convention, what impact will this have on the land and air?

There is a now a considerable body of research demonstrating the environmental compatibility of stabilised coal ash, yet in the USA where this work was pioneered almost 20 years ago there has been no large scale implementation of the technology. Incinerator ashes undoubtedly contain higher levels of potentially toxic components than coal ash but research to date has demonstrated the effectiveness of cement stabilisation. Scientists working on incinerator ash stabilisation in the USA have encountered fierce opposition, even to continuation of experimental studies, from political and environmental groups who do not want to consider the promising evidence to date. The NIMBY (not in my back yard) philosophy has been translated to NIMO (not in my ocean), and perceptions rather than facts hold sway.

The Atlantic States Marine Fisheries Commission in the USA has expressed concern over the long term stability of cement stabilised combustion/incineration ashes and has passed a resolution calling for the US Environmental Protection Agency and Army Corps of Engineers to develop and adopt criteria for their safe use.

At the same time, there is fierce debate over the use of stabilised ashes, while there seems to be widespread acceptance of the use of waste tyres in the marine environment, including use for building artificial reefs. There are millions of tyres used around the world for this purpose, yet there does not appear to be any background of concern and environmental evaluation comparable to that for the stabilised ashes.

Scientists in the field of waste material artificial reef research would welcome the establishment of guidelines and evaluation procedures as proposed by the London Convention Scientific Group, OSPAR and the Atlantic States Marine Fisheries Commission. There is a fundamental suspicion that waste artificial reef research is a step to sanctioning the dumping of waste in the ocean. Public education on waste disposal issues is vital to show that simply blocking certain disposal options may not be the most satisfactory solution. Waste materials are being produced in increasing quantities, in spite of recycling and waste reduction measures. The productive use of those which can be stabilised to ensure environmental safety is worth consideration. I hope that the following papers from the 2IOPS Symposium will stimulate informed debate and dispel doubts on waste ash use.

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