

The oxidative breakdown of acid azo dyes by Mn oxide mine tailings

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Introduction

The decolorisation of textile effluent is a pertinent issue in waste water treatment. Many biotreatment technologies achieve the reductive cleavage of the azo bond, which generates a range of aromatic amines that are colourless but significantly more carcinogenic than the parent azo compound [1]. Advanced oxidative techniques have been successfully employed to remove colour from waste effluents, however, these techniques are often expensive, thus the development of an oxidative textile water treatment technique utilising Mn oxide mining waste is appealing.

Discussion and Conclusions

The manganese tailings were reacted with two acid dyes (acid orange 7 and acid yellow 36) under a range of chemical conditions typically found in textile effluent. Results obtained using UV-visible spectroscopy, liquid chromatography mass spectrometry, high pressure liquid chromatograph and attenuated total reflectance Fourier transform infrared spectroscopy show that the Mn oxide tailings successfully decolourise the two acid dyes via an oxidative process. The terminal products have been identified as quinone type compounds. Reaction mechanisms, kinetics and orders have been established using *ex situ* and *in situ* spectroscopic techniques.

[1] Gottlieb, A., C. Shaw, A. Smith, A. Wheatley & S. Forsythe (2003) *Journal of Biotechnology* **101**(1), 49-56.

Cross-arc element mobility and prograde subduction metamorphism at the Kurile convergent margin

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Changes in the trace element and isotopic composition of cross-arc transects observed in many arcs globally in part reflect changes in the composition and/or volume of the slab component that ultimately reaches the depths of magma generation [1-4]. To address the origins of these cross-arc changes, we present a recently completed chemical characterization of the slab inputs (sediment and altered oceanic basalt from ODP Site 1179) that complements new and existing cross-arc data of the volcanic outputs from the wide, active Kurile convergent margin in the NW Pacific.

Particularly useful in cross-arc studies are elements that are mobile across the subduction zone interface such as B, Li, Pb, As, Sb, Cs, U, Rb and cosmogenic ¹⁰Be ($t_{1/2}$ ~1.5Ma). Elevated ¹⁰Be concentrations in all Kurile lavas analyzed to date requires the incorporation of subducted sediment [5]. Mass-balanced mixing relationships between the local mantle and various chemical extracts of the incoming crust demonstrate that the strong slab-fluid signature in Kurile volcanic front (VF) lavas and the waning signal in rear-arc (RA) lavas can be effectively modelled as a result of progressive updip loss of fluid-soluble elements during slab dehydration associated with prograde subduction metamorphism. The simplest interpretation that can explain multiple trace element and isotope (Sr-Nd-Pb-Hf-Me) systematics is that the cross-arc geochemical behaviour is linked to a transition in the mode of slab extraction with increasing depth-to-slab, from fluid to melt-like, coupled with previous updip depletion of fluid-soluble elements; partial melting of slab sediments beneath Kurile RA volcanoes have been previously inferred based on Hf-Nd systematics [6]. Results of integrated cross-arc studies have implications for the thermal and mineralogical structure of convergent margins as well as long-term element and mass flux.

[1] Ishikawa & Nakamura (1994) *Nature* **370**, 205-208.
[2] Ryan *et al.* (1995) *Science* **270**, 625-627. [3] Woodhead *et al.* (1998) *J. Pet.* **39**, 1641-1668. [4] Kimura & Yoshida (2006) *J. Pet.* **47**, 2185-2232. [5] Tera *et al.* (1986) *GCA* **50**, 535-550. [6] Tollstrup, D.L. *et al.* AGU Fall Meeting, 2007.