

Abstract

The objectives of this project were to contribute to the understanding of the microbiology of red mud and the possibility of neutralizing red mud using the metabolic activities of indigenous bacteria.

Red mud taken from the Pinjarra refinery of Alcoa of Australia Limited was found to be highly alkaline (pH 10.2 – 13.2) and saline (EC 9.99 dS/m) with up to 0.54 % w/w organic carbon. Despite these harsh conditions, 16 mesophilic, facultatively anaerobic bacteria were isolated from the red mud by enrichment culture. Amongst these isolates were Gram negative and positive motile rods and a Gram negative non-motile coccus, with varying tolerance to NaCl and pH. The majority of the isolates were able to produce acidic compounds in glucose media, either by oxidation, fermentation or both. These isolates were then inoculated into glucose amended sterile red mud to test the possibility of pH reduction by bacterial metabolism.

Three of the isolates were able to reduce the pH of sterile red mud amended with 6 % w/w glucose to near neutral conditions after 12 weeks. This required the production of approximately 0.2 mols H^+ /100 g red mud under aerobic conditions. Glucose in varying amounts was also added to non-sterile red mud to encourage the growth of the bacterial community in red mud. Greatest pH reduction in non-sterile red mud occurred in the presence of 3 % w/w glucose under aerobic conditions. For both glucose amended sterile and non-sterile red mud, there was a strong positive correlation between bacterial

biomass and pH reduction. In addition, pH reduction did not occur in the absence of oxygen.

The experiments showed that in the presence of glucose and under aerobic conditions, it is possible to reduce the pH of red mud using the metabolic products of indigenous bacteria.