

## Control of the Rheology of Iron Ore mineral and tailings Slurries

Y.K. Leong<sup>1</sup> MAusIMM, J. Drewett<sup>2</sup> and S. Bensley<sup>3</sup>

1. Professor, Department of Chemical Engineering, The University of Western Australia, Perth, WA 6009. Email: yeekwong.leong@uwa.edu.au
2. Senior Process Engineer, Rio Tinto Iron Ore, Perth, WA, 6000. Email: Jason.Drewett@riotinto.com
3. Principal Ore Processing, Rio Tinto Iron Ore, Perth, WA, 6000. Email: Scott.Bensley@riotinto.com

### ABSTRACT

The sudden increase of an iron ore tailings viscosity and yield stress due to factors such as a significant change in the tailings mineralogy or process water chemistry, could have a dramatic effect on the throughput of an iron ore processing plant. Because of the low price of the iron ore commodity all these plants must produce iron ore at a very high throughput to be economical. Plant bottleneck created suddenly by tailings developing a very high viscosity and yield stress is highly undesirable. In this presentation the performance of relatively cheap composite additives developed by UWA that can be used to control the rheology of iron ore tailings slurries from the Pilbara are presented. Reduction in the viscosity at a shear rate of  $100 \text{ s}^{-1}$  by as much as 95% can be achieved. Complete elimination of the yield stress can also be achieved. The composites based on a mixture of NaOH and phosphate-based additives can also be formulated to meet tailing disposal environmental requirements such as pH. These additives can also be used to upgrade the quality of iron ore by separating the clay component producing a lower alumina iron ore with a higher Fe content. It may be possible to remove the added phosphate that is left in the treated iron ore cheaply and easily. The significant reduction in the viscosity and yield stress of the treated iron ore mineral slurries and tailings means that they can be processed at a higher throughput if needed. The viscosity and yield stress of these treated tailings can be increased significantly at the tailing dams with a cheap chemical additive if necessary. A free flowing tailings may not be desirable in seismic active areas.