IH140100035 (Yu &20 CIs, ARC Research Hub)

**Project title:** ARC Research Hub for Computational Particle Technology

This ARC Research Hub aims to develop and apply advanced computational particle technology to model and optimise complex particulate and multiphase processes in the mineral and metallurgical industries, through close collaboration with leading international companies such as Rio Tinto, Baosteel, Longking, and Jiangsu Industrial Technology Research Institute (JITRI). This will be done through the achievement of the following objectives:

1) to develop novel and comprehensive theories and techniques to study and quantify not only the interaction forces but also the heat and mass transfer between particles (including nanoparticles), and between particle and fluid under various conditions;

2) to develop generic theories and corresponding computational technology for particle scale simulation of complex particulate and multiphase processes which may have widely distributed particle sizes and shapes, and multiphase flow strongly coupled with heat and mass transfer;

3) to develop and generalise an effective method to link the discrete and continuum approaches, and formulate, based on the particle scale results, the governing equations, constitutive relations and boundary conditions that can be implemented in continuum-based process modelling and optimisation;

4) to apply the developed theories and simulation/modelling techniques to solve challenging problems associated with various of processes or operations in the minerals, metallurgy and materials industries; and

5) to establish an advanced research platform to train postdoctoral fellows and research students in computational particle technology.

The Hub *officially* started its operation on 27 Oct 2016 because of the change of the industrial partners.

The ARC Research Hub for Computational Particle Technology (CPT) represents a significant research into particle science and technology in Australia and is jointly funded by the Australian Research Council and four international industrial partners from Australia and overseas. These organizations have come together to celebrate the launch on Monday 20th November 2017. Involved in the proceedings of the Hub launch were Senator the Honourable Scott Ryan, Minister Assisting the Prime Minister and Special Minister of State. Professor Sue Thomas ARC Chief Executive Officer and Monash University Professor Pauline Nestor, Senior Vice-Provost and Vice-Provost (Research) were also involved in the formalities.

In addition to the hub proposal, we have formulated the KPIs and sub-projects, our funding policy for all sub-projects have also been consolidated. 29 sub-projects including the IP agreements with the affiliated research organisations have been signed and most of them are progressing as scheduled, only a few projects were delayed due to the change of circumstances, however cautious measures were taken which will keep them move forward on track.

The major achievements of the Hub are summarised as below:

- 26 PhDs, 16 Postdoctoral/ Research fellows were recruited, and are working on the core Hub projects.
- The Hub is in partnership with other organizations and has organised three symposiums/workshops, notably, it will host the second international symposium on computational particle technology during Dec 4-8, 2018.
- The Hub CIs have been invited to give over 10 Plenary/keynote Lecturers in professional conferences and public.
- The Hub members have won quite a few major award: e.g. Director Aibing Yu was elected to Foreign Fellow, Chinese Academy of Engineering in 2017, Dr Qinfu Hou at Monash won the DECRA grant in 2017. A few Hub students and staff have also won various awards.
- Over $1M extra research funds were generated by the Hub members.