\*\*\* Hydrodynamics in a Randomly Packed Bed of Spheres: A Comparison between PR-CFD Simulations and MRI Experiments \*\*\*

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\*\*\*General Introduction\*\*\*

This dataset contains the data the supplementary data for the mentioned publication in order for other researchers to use this data in their own work. The experimental data are collected in the MRI lad of the Multi-scale Modelling of Multi-phase Flows group of the Department of Chemical Engineering and Chemistry, Eindhoven University of Technology. In addition, the simulation results are obtained from the in-house code that is implemented and used in the same group. This work is part of the research program TOP Grants Chemical Sciences with project number 716.018.001 which is financed by the Dutch Research Council (NWO) and is supported by the Netherlands Center for Multiscale Catalytic Energy Conversion (MCEC), an NWO Gravitation program funded by the Ministry of Education, Culture and Science of the government of the Netherlands.

\*\*\*Purpose of the test campaign\*\*\*

The purpose of these experiments and simulations was to investigate the hydrodynamics of the packed bed of spherical particles and validate the simulation using the experiments.

\*\*\*Test equipment\*\*\*

All experiments were performed on a 7T MRI scanner (MR Solutions Ltd), and the packing was packed randomly. The packing the reconstructed and imported to the PR-CFD simulations. Then all the velocity and flow values are compared using the MATLAB and Python scripts which are provided in the corresponding folders.

\*\*\*Description of the data in this data set\*\*\*

The folder contains different materials. First, you can find all the data of the graphs in the corresponding folders in a folder named “Figures”. Secondly, the MATLAB scripts for post-processing the CFD results are provided in the folder with the name of “Matlab script for PR-CFD”. These files are used to post-process the results that are got from the in-house FoxBerry code. The velocity maps of the PR-CFD results are obtained using the Python scripts which are provided in the folder with the name of “Python script for PR-CFD”. The MATLAB and the Python scripts are commented to improve the readability. The data in the error analysis section of the paper can be found in the “Error Analysis” folder.

Inside the folder ‘/Reconstructed packing’ the positions and radii of the particles are provided, which allows reconstructing of the spherical particle packing used in the flow simulations. The raw image data in DICOM format from which these sphere positions and radii are obtained is provided inside the subfolder ‘/Raw data’. Inside the folder ‘/Matlab script for MRI’ the velocity data obtained from the MRI experiments is provided. The scripts to calculate the velocity profiles in the article are provided as well. The raw spectrometer files in MRD format from which the velocity data is obtained are provided inside the subfolder ‘/Raw data’.