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Ultra-fast parallel magnetic resonance imaging of granular systems ALEXANDER PENN, Laboratory for Energy Science and Engineering, ETH Zurich and Institute for Biomedical Engineering, University and ETH Zurich, KLAAS P. PRUESSMANN, Institute for Biomedical Engineering, University and ETH Zurich, CHRISTOPH MÜLLER, Laboratory for Energy Science and Engineering, ETH Zurich — Several non-intrusive techniques have been applied to probe the dynamics of two-phase granular systems, with the most prominent examples being X-ray tomography, positron emission particle tracking (PEPT), electrical capacitance tomography and magnetic resonance imaging (MRI). MRI comes with the particular advantage that by implementing suitable pulse sequences not only spin densities (i.e. voidage), but also velocity, acceleration, diffusion and chemical reactions can be measured. However, so far the investigation of two-phase granular systems has been performed on relatively small-bore systems (max. diameter 60 mm). Such systems are, however, heavily influenced by wall effects. Furthermore, largely only single-coil detection has been employed, limiting severely the temporal resolution of the data acquisition. Here, we report the acquisition of ultra-fast MRI measurements in large volume vessels using medical MRI scanners. Specifically, parallel MRI, i.e. the simultaneous use of multiple receiver coils, has been exploited to speed up the data acquisition. In combination with advanced pulse sequences, we were able to probe the rapid dynamics (voidage and velocity measurements) of gas-solid systems.

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