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Combining fast neutron radiography with positron emission particle tracking in a tumbling mill system

Understanding the behavior of flow within dynamic systems is important to optimize the required outputs from such active systems. Non-destructive methods offer a significant advantage since the system may be preserved over multiple studies. We present the first dual measurements of the steady-state flow of material within a laboratory scale tumbling mill system which combine observables obtained from fast neutron radiography (FNR) and positron emission particle tracking (PEPT). FNR measurements were made using the CV28 Isochronous cyclotron at the Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, and PEPT measurements were made using a Siemens HR++ PET scanner at PEPT Cape Town laboratories, iThemba LABS, South Africa. We offer comment on the usefulness of combining a 2D transmission technique (FNR) with a 3D emission technique (PEPT) in order to validate existing numerical models of flow conditions within the system of interest.

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