Contribution ID: **449** Type: **Poster**

Measurement of Voidage/Holdup in Industrial Process Systems Using γ-Ray Densitometry

Wednesday 26 April 2017 14:15 (2 hours)

Multiphase flow reactors are commonly used in industry. One of the requirements for the efficient operation of these reactors is to have intimate contact or mixing between the different phases. Any spatial nonuniformity of the phases will adversely affect the process efficiency. Therefore, it is important to characterize the void fraction and holdup, and their spatial distribution in multiphase flow reactors. The γ-ray transmission technique commonly known as γ-ray densitometry is one of the commonly used techniques for measurement of voidage or phases holdup in multiphase flow systems because of its noninvasive nature and applicability to opaque systems. In γ-ray densitometry, a collimated radiation source (usually ^{137}Cs) and a scintillation detector are mounted in a horizontal plane across the diameter of the flow system under investigation. The narrow mono-energetic beam of the γ-rays with an incident intensity passes through the system (walls and material within the system). A fraction of the incident beam is attenuated within the system and the transmitted intensity of the γ-rays is recorded by the detector connected to a radiation counting system. Let us consider an industrial process system, i.e., gas-solid fluidized bed system and record intensity of transmitted γ-rays at three different conditions of operation, i.e., with empty system (with air), with solids and with two phase flow (fluidized condition), then the line averaged void fraction of the fluidized bed is estimated using equations detailed in [1]: The technique was used for estimating voidage/holdup in pilot-scale two phase flow systems, i.e., fluidized beds and bubble column reactor to evaluate mixing of the two phases $1, 2$. The results of the studies helped to understand the flow dynamics of the phases and validate or improve the design of the system.

[1] S. Bhowmick, *et al.*, Ind. Eng. Chem. Res., **54**, \#46, 11653–11660, (2015).\
[2] D. Mandal, *et al.*, Powder Technology, **226**, 91–98 (2012).\

Country/Organization invited to participate

India

Author: Mr PANT, Harish Jagat (Bhabha Atomic Research Centre, Trombay, Mumbai, India)

Co-authors: SAMANTRAY, Jitendra S. (Isotope and Radiation Application Division, Bhabha Atomic Research centre,Trombay, Mumbai 400085, India); SHARMA, V. K. (Isotope and Radiation Application Division, Bhabha Atomic Research centre,Trombay, Mumbai 400085, India)

Presenter: Mr PANT, Harish Jagat (Bhabha Atomic Research Centre, Trombay, Mumbai, India)

Session Classification: P-A1

Track Classification: RADIATION TECHNOLOGIES FOR MEASUREMENT