<<理想和无气泡流态化>>

图书基本信息

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前言

The distribution right of my book, "Idealized and Bubbleless Fluidization", throughout the world, excluding China, H ong Kong and Macao, was granted bythe publisher to Ellis H orwood, and even more unfortunate, the book has since itspublication in 1 9 9 2, not been available in domestic book stores. and 1imited copiesof the book were sold directly by the publisher to occasional callers. I have sincegiven from my own stock more than 6 0 copies of the book gratis to interestedcolleagues. However, since publication of the book, things have happened and progress hastaken place, including the following 7 monographs 1 handbook and 4 special issues pre—pared by members of our institute.

内容概要

When fluidization was first employed industrially, e.g., in the Winkler gasifier, we had only the bubblingfluidized bed as shown in the middle diagram of thefigure, in which gas bypasses as bubbles, thus leadingto poor solid-gas contact and incurring large pressuredrop. What is ideal is the high dispersion of solidsshown asthe background of the book jacket. Short ofsuch an ideal state, we may resort to suppressing bubblesby the use of shallow fluidized bed as shown on thelefthand side diagram achieved through reducing thesolid content of the fluidized bed. or the fast fluidizedbed with continuous recycfing of solids to the bottomof the bed, as shown on the righthand side diagram. Allthese diagrams of fluidization were generated throughcomputer modeling by Professor Wei Ge, and fromhosts of these diagrams, four were selected by Xue Bai, Jianxing Lu and Ying Ren to portray the principal thesisof this book.

作者简介

Mooson Kwauk graduated from University of Shanghai in1 943 and researched in fluidization under the late ProfessorRichard Wilhelm at Princeton University from 1 945 to1947. He has continued working in this field both in theUnited States and in China, and iS now Professor andDirector Emeritus of the Institute of Process Engineering ofthe Chinese Academy of Sciences, to which he was electedMember in 1980. In 1989 he received an InternationalFluidization Award of Achievement at the Sixth International Fluidization Conference held in Banff, Canada. The author postulates an idealized system of completehomogeneity that can be used in the analysis of many engineering problems, e. g. , · generalized fluidization with both solids and fluid in flow · fluidized leaching and washing · solids mixing and segregation · operation of conical fluidized beds These problems arise in hydraulic classification according to particle size anddensity , sedimentation and classification, continuous ion exchange or adsorption, watertreatment, fluid-bed electrolysis, and biochemical processes involving granular particlesand supercritical extraction of solid materials . Professor Kwauk also expoundsalternative bubbleless gassolid contacting systems, e. g. , dilute raining particles, fastfluidization, shallow fluidized beds, and particles fluidized under the influence ofoscillating flowsome of these techniques are already replacing their bubblingpredecessors. He proposes further a method for assessing the fluidizing performance ofpowders with a view to improving their gas-solid contacting behavior in the direction ofthe idealized state through particle design. Youchu Li graduated from Tianjin University in 1962 andwas appointed to the Institute of Chemical Metallurgy (nowProcess Engineering) of the Chinese Academy of Sciences. He is now a retired professor. As a researcher and directorof the Fluidization Laboratory, he developed correlations forthe dynamics of fast fluidization, multilayer fluidized bed, gas—solid mixing, mass and heat transfer in fluidization, andhe developed processes for magnetizing roasting of low-grade and complex iron ores, calcination of non-metallicores, clean coal combustion and pyrolysis and preparation ofvarious powdered functional materials. Professor Li received several awards from the State and the Chinese Academv ofSciences, and he summarized in 2008 his more than 40 years ’ R&D in fluidization in amonograph, “ Introduction to Fluidization Process Engineering ” (in Chinese). In thepresent publication, he contributed two addenda:one on recent studies on gas-solid flowand applications of fast fluidization and the other on the more recent area of magnetoflu—idization, both involving not a few of his own innovations.

书籍目录

章节摘录

Chapter 1 THE FLUIDIZED STATE 1.1 The Fluidized State and How It Is Achieved Fluidization refers to the process by which a fluid-like state is imparted to granularsolid particles by the application of appropriate external forces. The fluidity of a liquid ora gas has its origin in the mobility against one another of the constituent molecules. Solidparticles may be pushed apart from one another to acquire this mobility by thesteady upflow of a liquid or a gas at sufficient velocity. When this fluid flow starts at a re-latively low velocity through a static bed of solid particles, the interstitial pores amongthe particles offer sufficient resistance to the fluid to create a corresponding drop in pressure in the direction of flow （Figure 1-1 A）. As the rate of flow increases, this pressuredrop increases correspondingly until at some flow rate, this pressure drop equals theweight of the granular solids. At this point, the solid particles start to lose contact （Figure 1-1 B） from their neighbors below, which have up to this point offered mechanical support, andbecome buoyed up hydrodynamically. As the rate of fluid flow increases further, the parti-cles which are now suspended, cannot offer greater resistance due to their limitedmasses. Instead, the flowing fluid pushes the particles further apart （Figure 1-1C） tomake way for the increased flow, and the pressure drop remains constant at the samelevel corresponding to the solids weight. The point at which the fluid begins to buoy the particles by virtue of flow is calledthe incipient or minimum fluidization velocity u. The corresponding pressure drop AP isequal to the weight of the solids in the bed.

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