

<<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 limited 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.

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内容概要

When fluidization was first employed industrially , e.g. , in the Winkler gasifier , we had only the bubbling fluidized bed as shown in the middle diagram of the figure , in which gas bypasses as bubbles , thus leading to poor solid-gas contact and incurring large pressure drop. What is ideal is the high dispersion of solids shown as the background of the book jacket. Short of such an ideal state , we may resort to suppressing bubbles by the use of shallow fluidized bed as shown on the left hand side diagram achieved through reducing the solid content of the fluidized bed. or the fast fluidized bed with continuous recycling of solids to the bottom of the bed , as shown on the right hand side diagram. All these diagrams of fluidization were generated through computer modeling by Professor Wei Ge , and from hosts of these diagrams , four were selected by Xue Bai , Jianxing Lu and Ying Ren to portray the principal thesis of this book.

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## 作者简介

Mooson Kwauk graduated from University of Shanghai in 1943 and researched in fluidization under the late Professor Richard Wilhelm at Princeton University from 1945 to 1947. He has continued working in this field both in the United States and in China, and is now Professor and Director Emeritus of the Institute of Process Engineering of the Chinese Academy of Sciences, to which he was elected Member in 1980. In 1989 he received an International Fluidization Award of Achievement at the Sixth International Fluidization Conference held in Banff, Canada. The author postulates an idealized system of complete homogeneity 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 and density, sedimentation and classification, continuous ion exchange or adsorption, water treatment, fluid-bed electrolysis, and biochemical processes involving granular particles and supercritical extraction of solid materials. Professor Kwauk also expounds alternative bubbleless gas-solid contacting systems, e.g., dilute raining particles, fast fluidization, shallow fluidized beds, and particles fluidized under the influence of oscillating flowsome of these techniques are already replacing their bubbling predecessors. He proposes further a method for assessing the fluidizing performance of powders with a view to improving their gas-solid contacting behavior in the direction of the idealized state through particle design.

Youchu Li graduated from Tianjin University in 1962 and was appointed to the Institute of Chemical Metallurgy (now Process Engineering) of the Chinese Academy of Sciences. He is now a retired professor. As a researcher and director of the Fluidization Laboratory, he developed correlations for the dynamics of fast fluidization, multilayer fluidized bed, gas—solid mixing, mass and heat transfer in fluidization, and he developed processes for magnetizing roasting of low-grade and complex iron ores, calcination of non-metallic ores, clean coal combustion and pyrolysis and preparation of various powdered functional materials. Professor Li received several awards from the State and the Chinese Academy of Sciences, and he summarized in 2008 his more than 40 years' R&D in fluidization in a monograph, "Introduction to Fluidization Process Engineering" (in Chinese). In the present publication, he contributed two addenda: one on recent studies on gas-solid flow and applications of fast fluidization and the other on the more recent area of magnetofluidization, both involving not a few of his own innovations.

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## 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 granular solid particles by the application of appropriate external forces. The fluidity of a liquid or a gas has its origin in the mobility against one another of the constituent molecules. Solid particles may be pushed apart from one another to acquire this mobility by the steady upflow of a liquid or a gas at sufficient velocity. When this fluid flow starts at a relatively low velocity through a static bed of solid particles, the interstitial pores among the 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 pressure drop increases correspondingly until at some flow rate, this pressure drop equals the weight 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, and become buoyed up hydrodynamically. As the rate of fluid flow increases further, the particles which are now suspended, cannot offer greater resistance due to their limited masses. Instead, the flowing fluid pushes the particles further apart (Figure 1-1 C) to make way for the increased flow, and the pressure drop remains constant at the same level corresponding to the solids weight. The point at which the fluid begins to buoy the particles by virtue of flow is called the incipient or minimum fluidization velocity  $u$ . The corresponding pressure drop  $\Delta P$  is equal to the weight of the solids in the bed.

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