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3.3.2 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five year

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Smart Sensors Measurements and Instrumentation

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Fuzzy Cluster based PID Controller for a CSTR Process

B. Murugan, R. Vinodha, and B. Shoba

1 Introduction

PID controllers almost rule the process industries from 1940s, when Taylor and Foxboro instrument companies introduced their PID controllers. PID controllers gained their importance in process industries due to their ease of structure and implementation. However, the performance of these linear controllers is dominant only in the operating region, where they are tuned. Their performance degrades at shifted operating regime. To improve control performance of the PID controller suitable to nonlinear process, the controller parameters need to be changed for variation in operating point.

Multiple model-based controller design has gained attention for effective control of nonlinear processes [1–4]. Control of Continuous Stirred Tank Reactor (CSTR) units in the process industries is a major task, which needs simple, but effective and economical control algorithms. The chosen CSTR process [5] has a second-order dynamics with varying damping factor and undamped natural frequency. The literature survey states several control strategies like neural adaptive controller [6], fuzzy model predictive controller [7], observer-based model predictive controller [8], nonlinear PID controller, nonlinear model predictive controller [9], neural-based PID controller [10] and nonlinear predictive control using fuzzy Hammerstein model [11] on the chosen CSTR process. Despite these control schemes, yet

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High efficiency composite material based LED devices for health care applications III–V compound semiconductor based LEDs

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1.1 Introduction

For over several decades, scaling down of strong state transistor advances has been the main reason behind the achievement of all electronic industries. During this period, silicon (Si) has been the most generally utilized semiconductor materials for the assembling of semiconductor diodes (LEDs, LASERS, Solar cells), transistors (BJTs, HBTs and FETs) and other Integrated circuits (ICs). But, today, scaling down the Si devices arrived at its maximum limit. Scaling down of transistors is fundamental for the constant improvement of speed execution of ICs. To additionally improve the speed of ICs, Si is replaced with current III–V compound semi-conductors due to their transport properties, such as velocity saturation and mobility of the carriers.

This book chapter discusses the optimized Light emitting Diode with high efficiency for the health care applications.

1.2 III–V compound

III-V compound semiconductor is an alloy, containing elements from groups III and V in the periodic table. Material selection plays a vital in role electronic devices. Silicon (Si) and Germanium (Ge) are the most commonly used semi-conductors for manufacturing diodes such as diodes, transistors and ICs due to their remarkable properties such as low cost production and high temperature operation. Due to poor speed performance Si and Ge are not fit for future electronic applications. The next generation of semiconductors is considered to be III–V compound materials due to thermal stability and high frequency operation.

In the year 2003 when the first GaN substrate was effectively evolved [1–4].III-V Semiconductors offers material properties such as high carrier mobility and direct band gap which is used for optoelectronic applications rather than other compound materials such as II-VI etc.

Table 1.1 Few III–V group compound materials

Group III	Group V
B	N
Al	P
Ga	As
In	Sb

III–Compound semiconductors can be grouped mainly into three categories (as shown in table 1.1) namely binary, ternary and quaternary III–Vcompound semiconductors. III–V binary compound semi- conductors are made by combining two elements, one from group-III and the other from group-V.

1.3 Semiconductors

The main concern of all electronic devices is high performance with

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