Professor ***Parulekar***'s research interests are biochemical engineering and chemical reaction engineering. His present research activities in these areas are:

Biochemical Engineering

In the area of biochemical engineering, Professor ***Parulekar***'s research deals with production of extracellular and intracellular enzymes/proteins by recombinant and wildtype microorganisms, production of biochemicals using immobilized cell reactors, animal cell cultivations, and biodegradation of agrowaste-based polymeric products.

The research with recombinant organisms is aimed at gaining a fundamental understanding of hostplasmid interactions in these species and the effect of these interactions on plasmid replication, cell growth, and product gene expression. His research with wildtype microorganisms is directed toward understanding the mechanism of synthesis of extracellular enzymes such as amylases and proteases. The research dealing with immobilized cell reactors is focused on the study of alteration in cellular metabolism due to immobilization and implications of such alteration in the design of these reactors. The research with animal cell cultivations is concerned with shear sensitivity of animal cells, its implications in metabolic activities of animal cells, and identification of operating strategies for optimal production of desired metabolites in animal cell cultures. The research with agrowaste-based polymeric products is focused on studying the biodegradability characteristics of these products using enzyme mixtures, suspension and immobilized cultures of cell species responsible for biodegradation, soil columns, and understanding the kinetic and transport effects.

Chemical Reaction Engineering

In the area of chemical reaction engineering, his research is concerned with identification of optimal reactor structures for complex reaction networks and investigation of forced periodic operation of continuous flow (CSTR and tubular) reactors. Experimental investigation of production of acetylene, ethylene, ethane, and higher hydrocarbons via oxidative pyrolysis of methane and halomethanes in flow reactors is currently under investigation. The theoretical counterpart of this research is concerned with the development of detailed chemical kinetic models for this process.