CHAPTER 7

Biogas production from waste: technical overview, progress, and challenges

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7.1 Introduction

The energy sector is currently the most important area of research due to the depleting petroleum resources, the ever-increasing world population, and the need to solve the problem of climate change by reducing the emission of greenhouse gases (GHGs). These necessitate the search for an energy source that is environmentally sustainable and can help meet the increasing global demands of the near future. Hence tremendous attention is being given to biofuel technology as an alternative source of energy [1]. Biogas has multiple advantages as it is not only an environment-friendly fuel helping to reduce GHG emissions and waste recycling, but also produces a high quality fertilizer as a by-product along with electricity/heat production [2,3].

Although, the advantages of biogas have long been known, there has been a rekindling interest in this area due to the enormous amounts of wastes available, particularly in developing countries like India where waste management is a huge problem. A wide range of wastes (agricultural, municipal, animal droppings, and food waste) can be used as feedstocks for the production of biogas.

Biogas produced from the digestion of feedstocks under anaerobic conditions majorly constitutes methane (CH_4) (40%−65% v/v) and carbon dioxide (CO_2) (35%−55% v/v) with minute amounts of hydrogen sulfide (H_2S) (0.1−3% v/v), moisture, and other trace contaminants [3]. The anaerobic digestion (AD) process involves four different stages, namely hydrolysis, acidogenesis, acetogenesis, and methanogenesis, each

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