

INTRODUCTION

Ethyl benzene [100-41-4], also known as phenyl ethane and ethylbenzol, $C_6H_5CH_2CH_3$, M, 106.168, is a single ring, alkyl aromatic compound. It is almost exclusively (> 90%) used as an intermediate for the manufacture of *styrene monomer* [100-42-5], $C_6H_5CH=CH_2$, one of the most important large-volume chemicals. Styrene production, which uses ethyl benzene as a starting raw material, consumes ca. 50% of the world's benzene production. Less than 1% of the ethyl benzene produced is used as paint solvent or as an intermediate for the production of diethyl benzene and acetophenone.

Currently, almost all ethyl benzene is produced commercially by alkylating benzene with ethylene, primarily via two routes: in the liquid phase with aluminum chloride catalyst, or in the vapor phase with a fixed bed of either a Lewis acid or a synthetic Zeolite catalyst developed by Mobil Corporation.

The alkylation of aromatic hydrocarbons with olefins in the presence of aluminum chloride catalyst was first practiced by M. BALSHON in 1879[1]. However, CHARLES FRIEDEL and JAMES M. CRAFTS pioneered much of the early research on alkylation and aluminum chloride catalysis. Over a century later, processes that employ the classic Friedel-Crafts reactions chemistry remain a dominant source of ethyl benzene.

In 1965 ca. 10% of the United States ethyl benzene production was from the super fractionation of the mixed xylenes stream produced by the catalytic reforming of naphtha [2]. In 1986, the amount of ethyl benzene derived from this source was insignificant because of the escalating cost of energy.

Ethyl benzene was first produced on a commercial scale in the 1930's by Dow Chemical in the United States and by BASF in the Federal Republic of Germany. The ethyl benzene-styrene industry remained relatively insignificant until World War II. The tremendous demand for synthetic butadiene rubber (SBR) during the war prompted accelerated technology improvements and tremendous capacity expansion. This enormous wartime effort led to the construction of several large-scale factories, turning styrene production quickly into a giant industry. In 1986 the world annual production capacity of ethyl benzene exceeded 14×10^6 tonnes, of which ca. 40% was produced in North America.