CHAPTER I

INTRODUCTION

Since the entry into the atomic energy era in the early 1940, knowledge has been steadily accumulated on uranium geology and resources throughout the world. Uranium is indispensable in the production of atomic energy.

In a nuclear reactor, stationary conditions are established when the amount of neutrons released in a given volume is about equal to the amount of the neutrons which participate in new fission acts. Plutonium is also formed artificially as a result of the interaction of natural U^{238} with thermal neutrons according to the following equation:

$$_{92}U^{238} + {}_{0}n^{1} \longrightarrow {}_{92}U^{239} \xrightarrow[23\ \text{min.}]{\beta^-} {}_{93}Np^{239} \xrightarrow[2.3\ \text{days}]{\beta^-} {}_{94}Pu^{239}$$

Thus, the applications of uranium, as distinct from many other rare and nonferrous metals, are determined by its specific properties, the fission of the U^{235} isotope and the conversion of U^{238} to Pu^{239} by thermal neutron bombardment. In order to realize these processes the nuclear fuel must be of an exceptionally high degree of purity (nuclear pure), and must contain the uranium compounds in a specified form.

Processes for the extraction and purification of natural uranium from ores deposited in scattered regions of the world have been obtained.

Sandstone is a type of low-grade uranium ores, which had been found in many places including the famous Colorado Plateau of the United States. Uranium in sandstone may be associated with oxides of vanadium, copper or molybdenum, and may be oxidized by weathering to form secondary minerals such as carnotite ($K_2O.\ 2UO_3.\ V_2O_5.\ 3H_2O$) and tyuyamunite ($CaO.\ 2UO_3.\ V_2O_5.\ 8H_2O$) (1).

The ore (sandstone) used in the present study was obtained from the Department of Mineral Resources. The deposits occur in the North-Eastern part of Thailand at the latitude 16°40' north and longitude 102°13' east, in Amphur Puwieng, Khonkaen Province. (2) Based on the geological appearance, the mineralized area should be fairly extensive.

Realizing the strategic importance of this mineral the Office of Atomic Energy for Peace (OAEP) is now carrying out a detail investigation on the extraction and recovery of uranium from this ore. The present work which is one of the first phases of study, covers the laboratory scale of uranium extraction from the ore body by sulphuric acid leaching and subsequent extraction refinery.