# CHAPTER (5)

# INTRODUCTION

In Egypt, clastic and carbonate deposits are widely distributed along the Nile Valley, Eastern and Western Deserts and Sinai Peninsula. They are used directly and indirectly (after improvement of their physical and mechanical properties) in building purposes.

As revealed from part (1), the studied carbonate and clay deposits in this part are sandy limestone, dolomite and montmorillonitic clay which may be used for building purposes. Therefore, this part deals with possible utilization and evaluation of these deposits as building bricks and aggregates.

The term aggregate is used to describe variety of chemical inert substances which are mixed with cements, limes and gypsum plasters.

Aggregates are used for mortars, concretes and bricks. It can be divided into light and dense weight types. The light weight class includes pumice, clinker, foamed slag, expanded clay, shale and slate, exfoliated vermiculite and expanded volcanic glasses such as perlite. The dense weight aggregates consist of natural sands, gravels and crushed rocks (limestone, dolomite, basalt, etc.) together with artificial products such as air-cooled blast furnace slag and broken bricks.

Bahnasawy (1986) recorded that the thermal conductivity is influenced by the chemical composition and the texture of the coarse aggregate type, and an increase in the conductivity of aggregate causes increasing in the concrete conductivity. Also, he added that the limestone aggregate has a high thermal conductivity than basalt.

Houseein (1989) used the limestone dust in rigid pavements and recorded the following:

1- As small decreases in maximum dry density as the percentage of limestone dust increases.
2- The optimum moisture content decreases as the percentage of limestone dust increases.

Marie (1989) studied suitability of some limestone deposits for building purposes and recorded that there are many factors should be taken in the consideration:

1- The amount of dust adhering to the aggregates product should be determined before using. The removing of the fine materials adhering to the aggregates lead to an increasing in the compressive strength value.
2- The presence of the ankerite mineral in the carbonate rocks may react with the cement alkalies. Such reaction may affect on the durability of concrete product and it may cause expansion and cracking, consequently strength of the concrete blocks decrease markedly.

Abdoun (1994) studied behaviour of reinforced concrete and recorded that the crushed dolomite was found to be more suitable as coarse aggregate to produced high compressive strength concrete. This may be related to their

surface texture and surface area volume ratio.

Abdoun (1998) studied strength of concrete beams and observed that the limestone crushed stone can be used to produced high strength concretes.

The studied carbonate deposits belong to dense weight crushed aggregate type, while the expanded montmorillonitic clays considers as a type of light weight aggregate.

The utilization of clay deposits in the field of brick industry has been influenced by some problems which may be related directly to their inherent properties. These inherent properties depend on some factors specially the composition and structure of clay minerals which reflects on their physical properties during shaping, drying and firing. The influence of these factors could be summarized as follows:

Mellor (1914) showed that the clay is the weathered product of the silicate rocks containing sufficient hydrous silica of alumina in the softened condition to produce a plastic or semi-plastic mass when tempered with water.

Searle (1940) Norton (1949) and Searle and Grimshaw (1959) recorded that the mechanical properties of the fired mass would be influenced by the chemical composition which is related to the mineralogical composition in addition to the firing condition and the highest temperatures attains during firing.

White (1949) found that the plasticity of clays is influenced by the mineralogical composition. In general, attapulgite and smectite minerals are associated with the most plastic clays, illites are intermediate and the kaolinite confers the least plastic properties.

Searle and Grimshaw (1959) and Folk (1966) found that the drying behavior of shaped articles from the formed plastic pastes would be influenced by the mineralogical composition of the clay, the grain size of particles, the initial water content of the paste and the forming condition.

On the other hand, clay deposits are studied by many authors such as:

Faris et al. (1961) studied the sedimentology of some non-calcareous rocks and suitability of some Libyan and Egyptian clays for ceramic industry.

Hussein and Gad (1965) studied the physical characteristics and constitution of some Egyptian clays in addition to their suitability for refractory brick making.

Nasr et al. (1973) studied the constitution of some Egyptian clays, their high temperature phases and their suitability on refractories.

Galal (1978) studied some of physico-chemical properties of some Egyptian shales and clayey materials. Also, he investigated their evaluation for building materials production and concluded the following:

- Clays which essentially composed of kaolinite mineral have least bloating.
- Bloating characteristics depend on both the mineralogical and chemical composition of the used clay.

- Increasing in the bloating degree and behaviour of the utilized used clay after blending with crude oil as a gas liberating agent.

Kamel (1980) studied the effect of maturing on some of the technological properties of Wadi El-Natrun shale/clay deposits. The main conclusions of his study can be summarized as follows:

1-The maturing process for the studied shale/clay samples from Wadi El-Natrun area for periods up to 15 days. The plasticity of the clay samples could be modified; however to different extent.

2-The effect of maturing period strongly reflected on the rate and sensitivity of the studied samples to drying and also on the shrinkage value after the drying at 110° C.

3-The variation in the period of maturing reflected on the shrinkage value at different heating temperatures up to 750°C according to mineralogical composition of the used clay.

Abd El-Aziz et al. (1981) described the bloating behaviour of Sinai clay. They recommended that Sulphide-Sulphate addition could be used for the production of bloated clays for artistic aims, while the hematite-magnetite conversion is better when used for the production of bloated clays of regular and continuous volume increase which could be utilized in the manufacture of the light weight concrete.

Ramez (1986) compared the raw materials and mixtures used for making the traditional Egyptian red bricks with that used in the clay brick industry. He reported similarity in the composition of the used raw materials and recommended using the Egyptian desert clay deposits in building brick