Reuse of Concrete and Boron Waste from Recycling Point of View: Literature Review

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Abstract
This survey presents a literature review on the reuse of concrete and boron waste from recycling point of view with given a literature review and survey. That done through spotlight on the concrete and its properties, as well as, investigate and spot the light on the reuse of concrete and boron waste from recycling point of view. Moreover, the importance of research became as spotlight on the recycling and its features, and reuse as economic technology. Explain the importance of concrete and boron waste, as well as clarify the effect of boron waste on the environment. Recycling concrete can be used to producing concrete with predictable performance.

Key words: Recycling; Concrete; Reuse; Boron waste; and effect.

1. Introduction

Concrete is everywhere around us, in homes, schools, hospitals, bridges, roads, markets, offices, factories, and all components of modern life. It is an excellent material for building, characterized by its strength, durability, efficiency and economy. It also bears the weather and protects us from it [1]. With the increase in economic growth, population growth and the expansion of urban areas, cities have been demarcated and paved over the last 50 years. There is now a need for maintenance and increased need for construction, urban expansion and construction of new buildings [2]. This has led to a significant increase in the use of concrete. The use of concrete is estimated at 30 billion metric tons per year in the world and therefore plays an important role in the development of States Economy. However, the demand increase for the use and production of concrete is offset by a shortage of good quality raw materials on our land. The concrete industry consumes a large amount of natural raw materials and this has a direct impact on the environment and consumption of energy and economy as well. In addition, urban development coincided with the demolition of old buildings and structures, and consequently the accumulation and production of huge amounts of waste, which represent the old concrete, the largest part in addition to metals, wood, glass, ceramics and others [3, 4].

As a result, we have two problems, the first is a shortage of raw materials for the production of new concrete, and the second in how to get rid of the rubble and the remnants of old concrete. Hence, the idea of recycle and reuse old concrete in the production of new concrete, which has become a global trend of great interest. Especially in developed countries, which have gone a long way in the process of recycling and reuse of the components of old concrete for the great benefits of high yield on the provision of raw materials and reduce energy consumption also thermal emission [5]. Researchers have been experimenting with the best and most promising technologies, solving practical and technical problems in the application and recycling of aggregates caused by construction and demolition. In most developing countries, including Arab countries, this issue has not been given sufficient attention so far [6]. The fate of these wastes is often buried in low-lying land or illegally accumulating in vacant land and waste dumps

75% of the total solid waste in general. In the developing countries, where the urban expansion and re-planning and the establishment of infrastructure. Despite this importance, the issue was not given enough attention by manufacturers, decision makers, environmental and civil policy makers, or even researchers and engineers [7, 8].

In fact, this paper is intended to encourage stakeholders and investors to take practical steps to identify and measure the environmental impacts associated with waste disposal, as well as use a life-cycle methodology to identify treatment methods that provide the best solutions and improvements to the environment. In addition, the development of legal frameworks and financial resources and the preparation of trained human resources to promote the sustainable management of building and demolition waste, and building policies to reduce, reuse, recycle and evaluate waste rather than final disposal in landfills and landfills. The main aims of this research is to investigate and spot the light on the reuse of concrete and boron waste from recycling point of view. Moreover, the importance of research became as spotlight on the recycling and its features, and reuse as economic technology. Explain the importance of concrete and boron waste, as well as **c**larify the effect of boron waste on the environment.

Construction and Demolition Waste

In the construction and concrete construction sites, wastes such as new concrete residues, test samples, stones, bricks, sand, gravel, iron and others are the least and least polluted part of the "construction and demolition" waste [2, 9]. For the demolitions which consist of materials other than old concrete such as wood, plastic, asphalt, gypsum, dirt, old iron, windows, windows, electrical, water, sewage and other connections. Although construction waste and demolition waste share some characteristics and components, they vary widely in quantity and quality, yet can be referred to here as one component, "construction and demolition waste". These wastes, if not recycled or reused, must be transported from their site of origin to another remote location, and this transfer is costly both physically and environmentally. They are made up of different components and therefore, if they are to be recycled and reused, they must be separated and treated individually and each has different recycling and use techniques [6].

Concrete Industry

The concrete industry consumes a large amount of natural raw materials and energy used in heating, crushing, mixing and transport and produces large amounts of thermal emissions, pollution and waste. Concrete is a mixture of a paste that acts as an adhesive for a group of ingredients that can be called aggregate [1]. The dough consists of cement and water, encapsulated and surrounded by soft ingredients such as sand and coarse gravel and broken stones. Through a chemical reaction harden the paste and paste the other components together and the mixture is a solid rock-like substance called concrete. Cement is a chemical compound of calcium, silicon, aluminum, iron and other components obtained by mixing and heating natural raw materials to very high temperatures and then crushing them to form a soft material that reacts with water to form a paste of concrete. Concrete properties vary according to the quality of the components and their mixing ratios [10]. This results in a difference in mechanical and physical properties and is used as needed. As a result of the different components and their proportions in the mixture, many types of concrete are produced, including light, heavy and ready, polymeric concrete and others, each with properties suitable for different purposes and positions. These mixtures are tested to determine their suitability and achievement of the required specifications, and there must be laboratories in the work sites and concrete plants for that and for the development of other types [11, 12].

2. Recycling

The concept of recycling is the process of processing the materials used, such as: Household, agricultural or industrial waste, recycling and reuse to useful products to reduce their impact, reduce their accumulation in the environment. Thereby reducing water, air and soil pollution, as well as energy consumption and raw materials. The recycling process is carried out by separating the waste from each other first, based on the raw material and then recycling each material separately [8]. The idea of recycling began during the First World War and the Second World War, when the countries involved in the war suffered from a severe shortage of some basic raw materials, such as rubber, steel, etc., forcing countries to collect, reuse. Recycling has become one of the most important methods of managing waste disposal, or waste of all kinds, in most countries around the world, because of its many benefits to the environment and to humans [10].

Importance of recycling can be classifying as reduce global warming, which causes high temperatures on the ground, melting of the frozen pole. Reduce pollution of sea, ocean and groundwater with industrial waste. In addition, maintaining environmental cleanliness, cleaning industrial wastes, reducing the number of waste dumps, and protecting natural resources. Reduce landfills, and return those land plots to nature. Reduction of toxic gases, emitted from the burning process of waste. Minimize the depletion of raw materials for the manufacture of new materials, and thus continue for longer periods of time, for future generations. Minimize the energy consumption used to extract raw materials. Moreover, reducing unemployment, providing jobs and saving money, since the cost of recycling raw materials is less than extraction.

Recycling classifying as engineering and industrial process, where the main types of recycling are aluminum materials to aluminum foil for packing or some car parts also steel for vehicles. Textile materials and clothing. Cardboard sheets of magazines and newspapers, the manufacture of new cardboard paper. Glass containers, metal and other new packaging industry. In addition, unusable car tires, converted to other rubber materials, or mixed with street asphalt. Moreover, wastewater, irrigation water, or external use, thanks to water purification and disinfection plants. Plastic materials to bags, packing materials. Residues of food, spoiled, or expired food, for feed industry, organic fertilizer. The oil produced by the frequent frying process, in restaurants and houses, for the manufacture of lubricating oil.

3. Recycling and Reuse of Concrete

One of the common methods for recycling and using concrete is to break down old concrete and reuse it with certain proportions, such as soft and rough materials in the new concrete mix. This has benefits as well as caveats and conditions that must be taken into account when recycling and use. Concrete is a priority for concrete engineers to increase the life of concrete structures and their durability. As we know that the characteristics and features of concrete depend on their components in quantity and quantity. Therefore, the characteristics of the new concrete must be affected if the components of old concrete are added. Size and proportion of this component in the mixture. In contrast, not all locations and engineering structures require the same specifications of concrete. Using recycled concrete in road foundations, runways, floors, walkways, bicycles, etc. has many benefits and savings. Once again, I hope that this article will encourage researchers, engineers and stakeholders to pay attention to this really worthwhile subject.

4. Recycling and Reuse of Boron Waste

Inevitably, during industry developing some harmful wastes are produced. In fact, big amount of wastewater and mud are composed during boron production that lead to build ponds for the storage of wastewater [13]. On other side, those ponds damage vegetation as well as the environment, because of boron content. These wastewater stored ponds hard to find opportunities industry to reuse or recycling [13-15]. Boron waste is stacked in open-air near the ore that waste including the boron oxide will pollute the water and earth as well. The environmental impacts can be notes by transmitted to groundwater resource by disposed in open air [16, 17]. Some county such as China widely used considered boron as an important. The total proved reserve of boron resources is about 49.08million tons in China [17]. Figure 1 shows the environmental impacts of boron waste, which shown the disposal and storage will adding additional costs with respect of quantity that cannot be negligible [16, 18].

(a) (b)

Figure 1: the environment impact of boron waste where air storage in (a) and waste diffusion in (b) [16].

Generally, the boron waste is utilizing to producing of anhydrous borax, borax pentahydrate and borax decahydrate. In addition, because of the needs to be allocated a large area for disposal, the waste storage lead to environmental pollution and economical loss as well [16, 19]. Reusing of waste is helpful for saving costs also for environment protection. Therefore, several countries are starting reused as building material to this end. Recycling technology become under spitting light and studied by many scholars.

5. Literature survey

After read, some articles a literature survey has been prepared in the reuse of concrete and boron waste from recycling point of view, and after reading reference, we obtained some important points are as follows:

According to (M. Malešev, V. Radonjanin & S. Marinković, 2010), the satisfactory performance has been retched from recycled aggregate concrete. Generally, that performance did not differ from the performance of control concrete [9]. In fact, it is necessary to follow the minimum requirements to obtain good quality concrete using recycled aggregate [20]. According to the results of (L. Evangelista & J. de Brito, 2007), it is possible to utilizing fine recycled concrete aggregates that is viable to producing concrete with suitable for structural concrete [21]. (M. Behera, S.K. Bhattacharyya, A.K. Minocha, R. Deoliya, & S. Maiti, 2014) Through a review paper conclude that the recycling concrete can be producing by mechanical and durability performance, which generally inferior to conventional concrete. Nowadays, recycling and reuse concrete is gaining wide spread attention day by day to be used as a construction material [22]. In addition, recycling concrete can be used to producing concrete with predictable performance [23].

(Boncukçuoglu et al, 2003) in research about recovery of boron of the sieve reject in the production of borax. They concluded that the boron and its compounds might lead to some environmental problems. These problems like water pollution and soil [24]. (Uslu & Arol, 2004) study the usage of boron waste as an additive material in red bricks they believe that the boron and its compounds lead to some environmental problems, but on other hand, their study investigate the possibility of recycling and using clayey tailings from a borax concentrator in red brick and that improve the brick quality [25]. According to (ilker B. Topçu & A. Raif Boga, 2010) in their study in the effect of boron waste on the properties of mortar and concrete, it is necessity to make use of this waste [24]. Not to use the boron waste in relative high amounts lead to an economic loss. Otherwise, boron waste can be used as an additive material in the producing the cement, mortar a well as concrete. In recent years, this subject under investigation [24, 26-29]. In Turkey, one of the most important underground richness is boron ores, which Turkey has nearly about 53% of the world boron ores [30].

6. Conclusions

The main aims of this research is to investigate and spot the light on the reuse of concrete and boron waste from recycling point of view. Moreover, the importance of research became as spotlight on the recycling and its features, and reuse as economic technology. Explain the importance of concrete and boron waste, as well as clarify the effect of boron waste on the environment. Moreover, this paper is intended to encourage stakeholders and investors to take practical steps to identify and measure the environmental impacts associated with waste disposal. The performance of recycling concrete did not differ from the performance of control concrete. It is possible to utilizing fine recycled concrete aggregates that is viable to producing concrete with suitable for structural concrete. Boron waste can be used as an additive material in the producing the cement, mortar a well as concrete. In recent years, this subject under investigation.

7. References

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