With increasing demand for road construction and maintenance, a demand for high quality aggregate and higher performance asphalt being increased. Considerable research efforts have been expanded in this field since 1947. On the other hand, every year a tremendous amount of solid wastes are being generated and land filled. In Egypt this amount is approximately 1.4 million ton/year and the aggregate produced by quarries in some governments are not comply with the standard specification. This study aims to use some solid wastes produced as by product of industry to manufacture specific types of asphalt binder of penetration grade 2/5/4 to be used as a suitable binding material in production of hot mix asphalt (HMA) for surface and base layers (according to standard specification limits).

The prepared asphaltic mixtures consisting of low quality aggregate (high absorptive type) which is not used in paving or other applications. It is a known fact that, this type of aggregate is found in Egypt on large scale especially in Sharkia and Cairo governments. Also using waste marble dust which discarded from workshops and accumulated in land in very big quantities especially in Pattamia, Moskatam and Shak Althoaban areas in Cairo. The other objectives of this study are to keep the premium aggregate for longest period of time, decrease the cost of paving, increase the performance of HMA and add value for the waste materials. To achieve the aim of study, waste polymers were used as additives to modify asphalt \(1+1\) produced by the Al-Nasr and Alexandria Companies for Petroleum Refining and denoted as AC1 and ACT respectively. The additives were polypropylene (PP) discarded from carpet industry obtained from Oriental Weavers company, Tenth of Ramadan City, spent toner (ST) discarded from photo copier machines from Petroleum Research Institute, Nasr City, and waste polyester fiber (PE) of type polyethyleneterephthalate discarded from the Farasha company for printing and packaging Tenth of Ramadan City.

The experimental program was as follows:

- Characterization of different types of asphalt, including both of physical properties (penetration – dynamic viscosity – softening point – flash point – metals content – penetration index and aging) and physicochemical characteristics (by using column chromatography)
- Modifying asphalt samples by using the aforementioned waste polymers. These polymers were added in different percentages (0, 1, 1.5 and 3% by weight of asphalt).
- The physical properties and physicochemical properties of all modified asphalt samples were determined using SEM, TGA, FTIR, and X-Ray Diffraction.
- Choosing the best samples of modified asphalt based on workability and characteristics.
- Preparation of asphalt paving mixtures for use in surface and base layers using of Marshall test method which is still adopts in Egypt. The mixes composed of the high absorption aggregates, silica sand and waste marble powder.

The final results of study were as follows:

A-Physical properties:
Comparing to virgin asphalt it was found that in case of addition of polymers:
- The value of penetration decrease while, the values of viscosity, softening point and specific gravity increase so the workability of samples increased.

B-Chemical properties:
- For AC1 it was found that, aromatics and saturates contents increased in case of using PP and ST and decreased by adding PE. Resins content was found to decrease in case of addition of PE & PP and decrease in case of using ST.
- In the case of ACT it was found that, saturates content increased in case of PP, ST and PE and resins contents were decreased. Asphaltenes contents were obviously increased. Based on physical, physiochemical characteristics, aging and workability it was found that, 3% addition of the three waste polymers is optimum and suitable for paving purpose so, the asphalt pavement mixtures in lab were prepared by using modified asphalt using 3% of each added polymers separately.

C-Asphalt mixture phase
Reference asphalt paving mixtures were prepared using virgin asphalt with normal and high absorptive aggregates and it was found that, the optimum asphalt content (% by solid aggregate w/w) increased from 0.10 to 1.15 for AC1 and increased from 0.05 to 1.15 for ACT, in case of using normal and high absorptive aggregates respectively. Also, the value of the stability increased from \(1+1\) (lbs) to \(2+2\) (lbs) for AC1 and from \(1+1\) to \(2+2\) (lbs) for ACT. Flow increased from \(1+1\) to \(1+1\) (in) and from \(1+1\) to \(1+1\) (in) for AC1 and for ACT. The rutting values and bleeding distresses increased so, it is not beneficial to use high absorptive aggregate in HMA.
- All HMA prepared using modified asphalt, high absorptive aggregate and waste marble were suitable for use as surface course for roads have low traffic volume and base course for roads have high or medium traffic volume.
- The value of optimum modified asphalt content for HMA mixtures using both of AC1 and ACT decreased with high quality and performance which in turn, decrease the period of time necessary for maintenance and reconstruction.

The additives for asphalt were found to be suitable in the order of PP, ST and PE.
- The accumulated solid waste materials can be decreased so, the space needed for landfilling decreases too.
- The source of premium aggregates can be kept for longest period of time.