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### Construction and Application of Suspending Combination Ecological Filter Bed

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## Construction and Application of Suspending Combination Ecological Filter Bed

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**Keywords:** ecological filter bed, floating basket, flyash cenospheres, water body restoration

**Abstract.** A new kind of suspending combination ecological filter bed was constructed, which took floating baskets as basic units and took flyash cenospheres and attapulgite clay ultra light filter material as loading material. It integrated plant absorption, filter material adsorption with biofilm colonization to purify wastewater. Experiment showed that by the use of filter bed, TP, TN and COD can be removed effectively. Three kinds of plants, including green vegetables, spinach and American-four-season-green grass were cultivated in the filter bed and grew better than those planted in soils. Germination rate and speed of growth were faster than the controlled group. The application of filter bed didn't need land occupation and civil engineering construction. Meanwhile, it can restore the polluted water, reduce the operation costs and fulfill the recycling of eutrophication water.

### Introduction

Ecological filter bed was a water restoration technology which was developed from the vertical current artificial wetland. Because it integrated multiple purification mechanisms including filtration, absorption and the degradation functions of plants, animals and microbes, the repair effect was quick and steady, it can keep satisfactory operation effect even in low temperature seasons<sup>[1,2,3]</sup>. However, it had some defects, too. First, during the operation stage, the filter material was often blocked and hardened. So, it needed to wash and replace the filter material frequently. As a result, the cost of operation and maintenance was quite high. Second, it occupied big area. And usually the construction period of building projects was long. The application was under restrictions in cities as the scarcity of land resources<sup>[4,5]</sup>. By contrast, the technology of ecological float bed obtained extensive application because of the low operation cost and the easy to take away character<sup>[6]</sup>. Similar to the ecological filter bed, it had some drawbacks. The main drawback was that the water repair effect appeared very slow due to the plants' development period. Besides, it was easy to be influenced by seasons. So, it was difficult to fulfill continued and high efficient repair to eutrophication water<sup>[7]</sup>. By the limitation of the plants' cultivation methods and growing environment, the purification plants used in the ecological filter bed and the ecological float bed were mainly hydrophilic ornamental plants. It's hard to product economic value. After the purification plants were taken away from the filter bed or the float bed, they couldn't make the recycling of eutrophication water<sup>[8]</sup>. On the basis of the ecological filter bed and the ecological float bed, a combined filter bed was constructed. The technology of such combined filter bed didn't need land occupation and civil engineering construction. In addition to this, it could reduce the construction and operation costs and fulfill the recycling of the eutrophication water.

### Construction of the suspending combination filter bed

**Floating baskets design.** The floating baskets were the basic compositions of the suspending combination filter bed. It included basketry, water rings, bearing net and height adjustment element. The basketry was sealed up all around, while the bottom used screen cloth. The water ring was cup jointed around the outboard of the basketry through the height adjustment element. The bearing net was connected in the inner wall of the basketry and was situated 100mm lower than the upper fringe of the basketry, was shown in Fig. 1.

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