Abstract

As a result of previous developments, it can be predicted that the traffic load will continue to increase in the future. An adaptation of the building material technology is therefore essential. In addition, the society aims to reduce CO2 emissions. In order to take account of both points, the suitability of a reaction resin (polyurethane) based on renewable raw materials with regard to its applicability as a binder in road construction was investigated in this work.

For that purpose, in the first step some of the current fields of application of so-called polymer concrete have been described. These are, inter alia, Production of drainage systems, machine frames and, in the area of road construction, small-scale concrete maintenance.

This was followed by a basic presentation of the chemistry of the polyurethanes and notes on the handling and storage of these substances.

In order to be able to estimate in advance the processing properties of the polymer concrete and to provide characteristic values for a numerical comparison with other reaction resins, a characterization of the polyurethane was carried out. This characterization involved the chemical, physical and rheological properties as well as the fatigue behavior. The results of these investigations indicated suitability for use as binders in road construction.

Subsequently, different polymer concrete variants were produced and tested using standardized test methods for asphalt. It was found that, when using a composition based on asphaltic mix, the polymer concrete produced provides equivalent or better results than the reference asphalt in all test procedures. This confirms the investigations on the polyurethane and thus the usability as binder in road construction for the production of bonded layers for the road surface.

Following, a theoretical treatment of the subject areas of large-scale processing and reuse of polymer concrete was carried out, in order to provide initial indications for the practice. The resulting remarks are to be examined in practice and, if necessary, adapted to the existing framework conditions.

Finally, recommendations were made for the further scientific and practical examination of this topic and the results summarized.