

The Potential of Sisal as a reinforcing Fibre in Cement base materials

Abstract:

The inclusion of fibre reinforcement in concrete, mortar and cement paste can enhance many of the engineering properties of the basic materials, such as fracture toughness, flexural strength and resistance to fatigue, impact, thermal shock and spalling. In recent years, a great deal of interest has been created worldwide on the potential applications of natural fibre reinforced, cement based composites. Investigations have been carried out in many countries on various mechanical properties, physical performance and durability of cement based matrices reinforced with naturally occurring fibres including sisal, coconut, jute, bamboo and wood fibres. These fibres have always been considered promising as reinforcement of cement based matrices because of their availability, low cost and low consumption of energy. In this review, the general properties of the composites are described in relation to fibre content, length, strength and stiffness. A chronological development of sisal fibre reinforced, cement based matrices is reported and experimental data are provided to illustrate the performance of sisal fibre reinforced cement composites. A brief description on the use of these composite materials as building products has been included. The influence of sisal fibres on the development of plastic shrinkage in the pre-hardened state, on tensile, compressive and bending strength in the hardened state of mortar mixes is discussed. Creep and drying shrinkage of the composites and the durability of natural fibres in cement based matrices are of particular interest and are also highlighted. The results show that the composites reinforced with sisal fibres are reliable materials to be used in practice for the production of structural elements to be used in rural and civil construction. This material could be a substitute asbestos-cement composite, which is a serious hazard to human and animal health and is prohibited in industrialized countries. The production of sisal fibres as compared with synthetic fibres or even with mineral asbestos fibres needs much less energy in addition to the ecological, social and economical benefits