TEXTILE REINFORCED CEMENTITIOUS COMPOSITES WITH NATURAL FIBERS AND NON-TRADITIONAL CEMENTS – TREATMENT OF THE FIBERS TO REDUCE THEIR SWELLING IN WATER

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Cementitious matrix composites are gaining interest in recent years. Also, natural fibers are getting more attention as reinforcement because they are widely available, eco-friendly, cost-effective, sustainable, lightweight, biodegradable, non-toxic, and renewable materials. The most abundant and cheapest natural fibers are cellulose-based. Cementitious materials are well known for their brittleness, low tensile strength, and poor resistance to crack propagation. The use of natural fibers in cementitious materials enhances properties such as tensile strength, fracture toughness, flexural strength, fatigue resistance, and thermal shock. These fibers play an essential role in controlling cracks in concrete and decreasing the permeability of concrete. A negative effect of the natural fibers is that they have a high capacity to absorb moisture resulting in volume changes, which leads to the bending of the composite and even generating cracks. Overcoming this burden is the key to a breakthrough in using natural fiber in thin cementitious plates. In this work, the modification of natural cellulosic fibers was performed to reduce their water uptake, and consequently to improve the durability and mechanical properties of the composite. The main objective of the work was to develop durable and sustainable textile-reinforced cementitious composites with different natural fiber/cementitious matrix combinations. Different techniques were used, such as Fourier transforms infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and water absorption method, to measure the open porosity. The mechanical properties of the textile reinforced cementitious composites as well as the corresponding matrix were obtained by 3-point bending and compression test, respectively. It is found that treating natural fiber by sodium hydroxide solution removes the impurities, hemicellulose, and lignin and improves the interface between the matrix and fiber. Thus, the obtained composite with treated natural fiber gave a slightly higher flexural strength in comparison with the composite with untreated natural fiber.