

Review of polyvinyl alcohol (PVA) fibre in cementitious composites: properties and effect

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Abstract: The effect of uncoated polyvinyl alcohol (PVA) fibre addition on dynamic properties of fibre reinforced concrete (FRC) has been investigated in the current study. PVA fibres of two geometric lengths (6 and 12 mm) with aspect ratio of 428 and 857, respectively, were utilised. Fly ash was also used as partial replacement of Portland cement in all mixes. Based on total concrete volume, two fibre fractions of 0.25% and 0.5% were evaluated for their effect on fundamental frequency, dynamic modulus of elasticity and damping ratio of FRC. 28-Day static mechanical properties are also measured. From the results, it can be stated that although PVA fibre addition in low volume fractions used in this study significantly enhance the mechanical properties of FRC, it has no considerable effect on concrete material damping characteristics.

Keyword: Polyvinyl alcohol, ECC, Fibre reinforced concrete

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Introduction

The development of polyvinyl alcohol fibre took place in 1939 and is accredited to Dr. Sakuradas and assisting research group of Kyoto Imperial University of Japan. In 1950, Kuraray Corp began to commercially manufacture and sell PVA fibre as the first Japanese organic fibre (Horikoshi, Ogawa, Saito & Hoshiro). The production of PVA is via polymerization of vinyl acetate to polyvinyl acetate (PVAc), pursued by hydrolysis of PVAc to PVA. The chemical structure of PVA is reasonably simple with a pendant hydroxyl group.

To date PVA fibre has multiple uses which include fishing nets, seaweed farming nets, ropes, hoses, belts, tire codes, paper making felts and more. In regards to a cementitious matrix, PVA fibres impose good flexural strength to the composite. This is due to its excellent interfacial bond with the matrix. Refer to Figure 4 for PVA in the form of fibres for use in fibre