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A novel test setup for the characterization of bridging behaviour of single microfibres embedded in a mineral-based matrix

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1 **A novel test setup for the characterization of bridging behaviour of single**
2 **microfibres embedded in a mineral-based matrix**

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9 **Abstract**

10 The mechanical performance of fibre-reinforced, mineral-based composites, such as
11 strain-hardening cement-based composites (SHCCs), is determined to a great extent by the
12 bonding between dispersed fibres and matrix and the corresponding bridging action of
13 fibres crossing cracks. To characterize such interactions between fibre and matrix, single
14 fibre pull-out tests in a single-sided configuration are usually performed. Such tests are
15 relatively simple and straightforward, but they have some major limitations. To overcome
16 these limitations, a novel setup is suggested in the article at hand. First, setting up,
17 preparation of specimens, testing procedure and data evaluation are described in detail.
18 Then, the results obtained in the quasi-static monotonic tests on individual PVA
19 microfibres embedded in a fine-grained, cement-based matrix are presented and discussed
20 under consideration of corresponding results gained by conventional single-sided fibre
21 pull-out tests on specimens made of the same constituents. Next, the experiments with the
22 new setup are performed at a higher displacement rate so that the rate effect on the pull-
23 out force-crack opening behaviour can be investigated. Finally, the applicability of the
24 new setup for testing fatigue behaviour of the composite on the micro-scale is
25 demonstrated by means of cyclic tests in tension-compression regime. Such tests cannot
26 be performed using conventional fibre pull-out tests.

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28 Keywords:

29 Cement-based composites, fibre reinforcement, PVA microfibre, bonding behaviour, fibre
30 pull-out test.

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