

Porous asphalt mixture with improved fatigue resistance and stormwater pollutants reduction in urban road pavement

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Supplementary Data

Figure

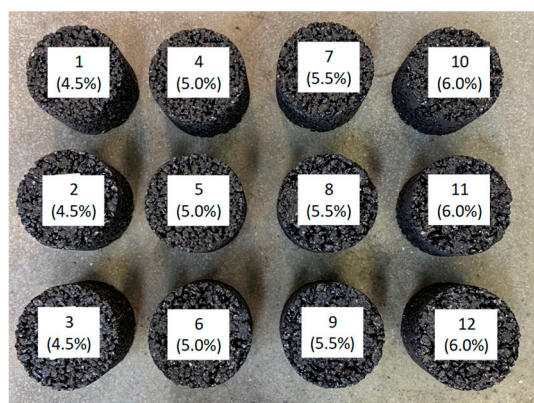


Figure S1. Compacted samples.

Tables

Table S1. Crush aggregate (9.5 mm) characterization tests results.

Properties	Unit	Limit	Result
Los Angeles abrasion	%	30 (max)	21.47
Water absorption	%	-	0.47
Flakiness index	%	10 (max)	9.0
Durability ¹		12 (max)	2.8

¹ ASTM C88 [94].

Table S2. Water quality limits for non-potable purposes (Based on [68]).

Parameters	Limit
pH	6.0 – 9.0
Faecal coliforms	Non-detectable
Colour (HU ¹)	≤ 10
Turbidity (TU ²)	≤ 2
Odour and appearance	Not unpleasant
Chemical oxygen demand (mg/L)	≤ 10
Nitrate (mg/L)	≤ 10
Ammoniacal nitrogen (mg/L)	≤ 20
Nitrite (mg/L)	≤ 1
Total Phosphorus (mg/L)	≤ 0.1
Total Suspended Solids (mg/L)	≤ 5

¹ Hazen Unit; ² Turbidity Unit

Table S3. Measurements to evaluate the porous mixture infiltration efficiency.

Rain event	h _s ¹ (mm)	h ₁ ² (mm)	h ₂ ³ (mm)	E ₁ ⁴ (%)	E ₂ ⁵ (%)
1	23.0	21.5	21.0	93.5	91.3
2	32.5	29.5	28.9	90.8	88.9
3	11.5	10.5	10.0	91.3	87.0
4	14.5	12.5	13.0	86.2	89.7
5	6.0	4.5	5.0	75.0	83.3
6	15.0	13.5	12.9	90.0	86.0
7	9.0	8.0	8.5	88.9	94.4
8	14.5	13.0	13.5	89.7	93.1
9	18.5	17.5	17.3	94.6	93.5
10	15.0	14.0	13.6	93.3	90.7
11	20.0	18.5	18.4	92.5	92.0
12	13.5	11.5	11.2	85.2	83.0
13	10.5	10.0	9.8	95.2	93.3
14	20.5	18.5	19	90.2	92.7
15	17.5	15.5	14.7	88.6	84.0
16	8.5	7.0	7.3	82.4	85.9
17	18.0	17.0	17.6	94.4	97.8
18	28.0	27.0	27.1	96.4	96.8
Mean	-	15.0	14.9	89.9	90.2
SD⁶	-	6.5	6.4	5.2	4.5

¹ Height of rainwater stored in the empty box; ² Height of rainwater infiltrated through the slab 1; ³ Height of rainwater infiltrated through the slab 2; ⁴ Infiltration capacity of the slab 1; ⁵ Infiltration capacity of the slab 2 ⁶ Standard Deviation.

Table S4. Water quality evaluation collected from stormwater runoff (road) and filtered through the porous mixture slab.

Sample	Runoff	Slab	Difference
<i>pH</i>			
1	7.00	6.80	2.9%
2	7.50	7.31	2.6%
3	7.36	7.15	2.9%
4	7.34	7.22	1.7%
Mean	7.30	7.12	2.5%
SD	0.21	0.22	0.6%
<i>Colour (HU)</i>			
1	110	94	17.0%
2	208	209	-0.5%
3	209	182	14.8%
4	95	109	-12.8%
Mean	155.5	148.5	4.6%
SD	61.5	55.7	14.0%
<i>Turbidity (TU)</i>			
1	33.2	24.2	37.2%
2	61.1	25.4	140.6%
3	55.0	36.6	50.3%
4	21.8	18.3	19.1%
Mean	42.78	26.13	61.8%
SD	18.4	7.6	54.0%

Table S.4 continued

<i>Chemical oxygen demand (mg/L)</i>			
1	8.8	6.1	44.3%
2	11.0	11.0	0.0%
3	7.7	6.3	22.2%
4	6.6	7.8	-15.4%
Mean	8.53	7.80	12.8%
SD	1.88	2.26	26.1%
<i>Nitrate (mg/L)</i>			
1	0.45	0.63	-28.6%
2	0.10	0.51	-80.4%
3	0.22	0.01	-*
4	0.50	0.34	47.1%
Mean	0.32	0.37	-20.6%
SD	0.19	0.27	36.6%
<i>Ammoniacal nitrogen (mg/L)</i>			
1	0.84	1.31	-35.9%
2	1.31	1.11	18.0%
3	0.66	0.81	-18.5%
4	0.28	0.63	-55.6%
Mean	0.77	0.97	-23.0%
SD	0.43	0.30	31.2%
<i>Nitrite (mg/L)</i>			
1	0.06	0.09	-33.3%
2	0.06	0.06	0.0%
3	0.05	0.04	25.0%
4	0.02	0.03	-33.3%
Mean	0.05	0.06	-10.4%
SD	0.02	0.03	28.4%
<i>Total Phosphorus (mg/L)</i>			
1	1.23	0.31	296.8%
2	0.06	0	-*
3	0	0	-*
4	0.37	0.06	516.7%
Mean	0.42	0.09	406.7%
SD	0.57	0.15	155.5%
<i>Total Suspended Solids (mg/L)</i>			
1	180	36	400.0%
2	104	4	2500.0%
3	36	12	200.0%
4	72	8	800.0%
Mean	98.00	15.00	975.0%
SD	61.32	14.38	1046.8%
<i>Faecal coliforms</i>			
1	461.1	365.4	26.2%
2	2,419.2	435.2	541.9%
3	1,413.6	376.9	224.8%
4	770.1	658.3	17.0%
Mean	1,266.00	458.95	202.5%
SD	865.15	136.37	245.7%

*not considered.

Table S5. Soil (subgrade layer) characteristics [75].

Parameters	Data
Poisson coefficient	0.45
Specific mass (g/cm ³)	1.629
<i>Resilient parameters</i> ¹	
k ₁	739.20
k ₂	0.34
k ₃	0.004

¹ Resilient modulus calculated according Equation S1.

Equation

$$RM = k_1 \times \sigma_3^{k_2} \times \sigma_d^{k_3} \quad (S1)$$

Where RM is the resilient modulus (MPa); σ_3 is the principal stress (MPa), σ_d is the deviator stress (MPa); k₁, k₂ and k₃ are the experimental coefficients.