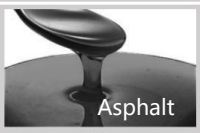
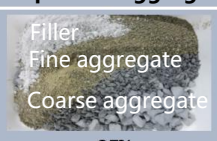
Under R&D

Recycled Plastic Asphalt Pavement

Revêtement en asphalte à granulats de plastique recyclé

What is recycled plastic asphalt pavement?

- It is asphalt pavement in which all aggregate is made from waste plastic.
- Binder technology which enables even waste plastic aggregate having low interlocking to develop strength.

	Purpose of binder	Purpose of aggregate
Ordinary asphalt pavement	 Asphalt 5%	 Filler, Fine aggregate, Coarse aggregate 95%
Developed recycled plastic pavement	Asphalt  Recycled plastic Type A 	Recycled plastic Type B 

Percentage is based on weight

Challenges in using waste plastic as the entire aggregate

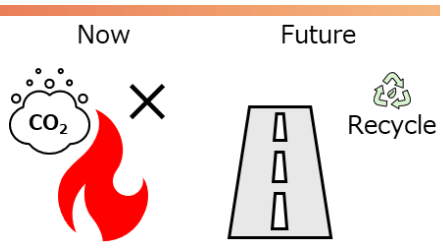

Improved Type II binder


Developed binder

Wheel tracking test result

Features

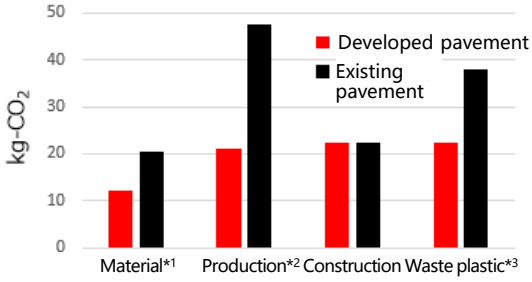
- Waste plastic that is normally incinerated is used as aggregate
- Lightweight (low density)
- All constituent materials are hydrophobic
- Low heat capacity
- Binder that functions as the structural skeleton



Effects

- Reduces CO_2 emissions (approximately 40% less than conventional asphalt pavement)
- Requires less energy for transportation
- High water resistance
- Low energy consumption for mixture production
- High durability (high dynamic stability)

CO_2 emissions per m² of pavement (kg-CO_2)



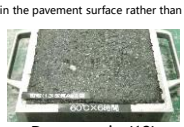
*1 The figure for material includes material extraction, material production, and material transportation.
*2 The figure for production includes mixture production and mixture transportation.
*3 The figure for waste plastic includes intermediate treatment, incineration, and landfilling.

Performance evaluation result

Test item	Test condition	Unit	Recycled plastic mixture	Dense grain (13) StAs60/80	Dense grain (13) Improved AsII type
Binder amount	—	wt%-in	**30.0**	5.2	5.4
Marshall density	20°C	g/cm³	**0.962**	2.394	2.394
Marshall stability	Submersion at 60°C for 30 minutes	kN	**13.4**	8.9	13.4
Dynamic stability	60°C	Passes/mm	**63,000**	1,430	9,000
Raveling loss	-10°C	cm²	**0.09**	0.50	0.28
Cantabro loss	-10°C	%	**0.09**	20.3	12.2
Bending fracture strain	20°C	—	**77.0×10^{-3}**	20.7×10^{-3}	18.3×10^{-3}
	-10°C	—	**21.6×10^{-3}**	1.7×10^{-3}	2.6×10^{-3}
Bending fatigue strain	0°C/900 × 10^{-6}	Passes	**Over 8 million**	—	—
Submerged WT test*	60°C/6Hr	—	**No deformation**	Granulates in 3.5 hours	Stripping on entire surface
	60°C/12Hr	—	**No deformation**	—	—
Repeated surface stripping depth	60°C/1,000 passes	mm	**0.5**	Over 25	9.3

*With reference to the "Flooded wheel tracking test" in the Pavement Design and Construction Guidelines (June 2019) issued by Metropolitan Expressway Co., Ltd.
An evaluation was performed based on changes in the pavement surface rather than the ratio of stripped area on the specimen cross-section.


Dense grain (13) StAs 60/80 6 Hr, 60°C


Dense grain (13) Improved type II 60/80 6 Hr, 60°C


Recycled plastic asphalt 12 Hr, 60°C

Flooded wheel tracking test result

Demonstration test example

Test item		Test condition
Construction site		ENEOS Platform Hitachino-Ushiku SS (Ushiku City, Ibaraki Prefecture)
Construction area		Total: 25 m²
Traffic volume classification		Parking lot for EVs and walkway
Construction period		March 2024
Recycled plastic aggregate	Type	Cross-linked polyethylene (waste wire coating material)
	Usage	Total: 1 ton
	Usage per unit area	40 kg/cm²
CO_2 emission reduction effect	Reduction amount	Total: 1.2 tons
	Reduction amount per unit area	48 kg/cm²

Demonstration at the ENEOS Platform Hitachino-Ushiku SS

ENEOS CORPORATION
https://www.eneos.co.jp/english/
NIPPO CORPORATION
https://www.nippo-c.co.jp/en/

ENEOS NIPPO