

An aerial photograph of a tropical beachside road. The road is paved and curves along the coastline. Two cyclists are riding on the road. The beach is sandy and lined with palm trees. The ocean is visible in the background with waves breaking on the shore. The word "LIPPER" is written in large, white, bold letters in the top right corner.

**LIPPER**

# Bio Rubber Reinforced Material

## LIPPER(NR100-18)

Bio-rubber reinforced material LIPPER(NR100-18) is a masterbatch rubber with 18% cellulose nanofibers highly dispersed in natural rubber. This masterbatch rubber can be blended in tire rubber formulations for bicycles and e-scooters as a substitute for carbon black, producing environmentally friendly tires that maintain tire performance. In an environmentally-conscious society, mobility demands innovative eco-friendly tires. We contribute to the production of tires for a new era that meets the needs of society, new regulations, and people's values.

# LIPPER(NR100-18) is designed to improve tire performance

By blending LIPPER(NR100-18), a bio-rubber reinforcing material, with cellulose nanofibers at 3% to 6% in a tire rubber compound, tire performance and environmental performance can be improved. It simultaneously achieves the durability required for tires, the reduction of power consumption required for electric mobility, the reduction of CO2 emissions, and the reduction of environmental impact caused by tire wear dust.



## Environmental performance

Replacing petroleum-derived carbon black with LIPPER(NR100-18), which is derived from natural materials, will contribute to the reduction of CO2 emissions. This will result in a tire suitable for eco-friendly micromobility.



## Abrasion performance

The results of our driving tests show high performance for wear resistance, i.e. the basic performance of the tire. The amount of wear is reduced, resulting in tires with a longer cruising range.



## Power Consumption Performance

With respect to the energy efficiency required of tires in the age of electric mobility, LIPPER(NR100-18) contributes to improved performance. It produces a high rolling performance tire with 20-30% better performance.



## Strong colored tires

One of the weak points of conventional colored tires is their low durability. By using LIPPER(NR100-18) as a reinforcing material without carbon black, colored tires can be achieved while maintaining tire performance.

## In 2040, the world's tires will be white again!

Since Dr. Goodrich's invention of carbon black tires, the era of black tires has lasted for more than 100 years. Now, LIPPER(NR100-18) can be used to help maintain and improve the functional performance of tires while reducing the use of petroleum-based carbon black. We envision a future where the world's tires will once again be white and clean by 2040.

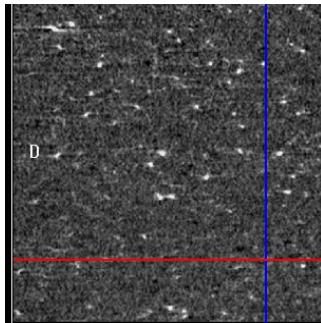
**LIPPER**



<http://lipper.io>

# Tire Innovation through Nanotechnology

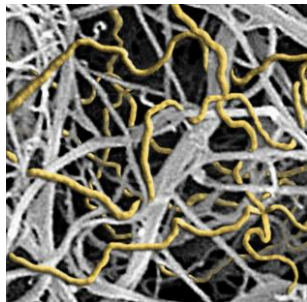
LIPPER(NR100-18) is a next-generation tire reinforcing material made from wood and using nanotechnology. It is a rubber reinforcing material with a high biomass content that can be added to natural and synthetic rubbers to improve rubber properties.



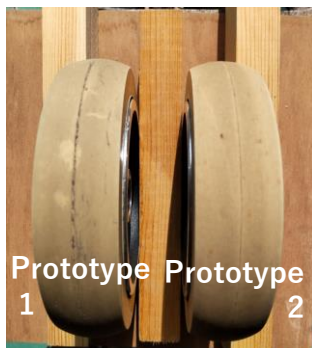
One nanometer is a measure equal to one millionth of a millimeter, while nanotechnology refers to the manipulation of matter on an atomic and molecular scale. LIPPER(NR100-18) was created using this technology, widely considered a field poised for major growth in the 21st century.

## Beyond carbon black

In conventional technology, rubber was strengthened by adding carbon black to natural or synthetic rubber. The use of LIPPER(NR100-18) now makes it possible to strengthen rubber while producing freely color-colored rubber products.



This image depicts nanofibers (white) entangled with rubber molecules (yellow) to increase tire strength.



This photo shows a prototype tire for an e-Scooter. After completing the running test, this photo clearly shows the difference in the degree of wear between Prototype 1 without LIPPER(NR100-18) and the results of running with LIPPER(NR100-18).

### Point of Note

An increased biomass content is associated with a reduction in CO2 emissions and contributes to a carbon-neutral society.

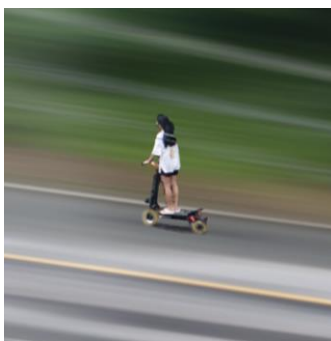
# Innovating Tires for Micromobility

Micromobility is increasingly garnering attention as a comfortable, safe and 'clean' mode of mobility, as well as being a tool for the development of healthy and people-oriented urban development. We offer a material optimized to create the best eco-friendly tires for this sphere.

We support your company in creating tires to meet the needs of today's environmentally-minded society and consumers.

## Main Applications

- Bicycle tires
- Wheelchair tires
- E-Scooter, etc.



## Towards Walkable Cities

Walkable cities are cities and ideas designed around pedestrian and low-speed mobility. Increasingly, emphasis is being placed on the convenience of being able to get anywhere on foot, bicycle, or by public transportation without a car, and on having an environment that is both enjoyable and safe to walk in. The environmental performance of micromobility, as a familiar and accessible mode of transport, is expected to increase in demand going forward.

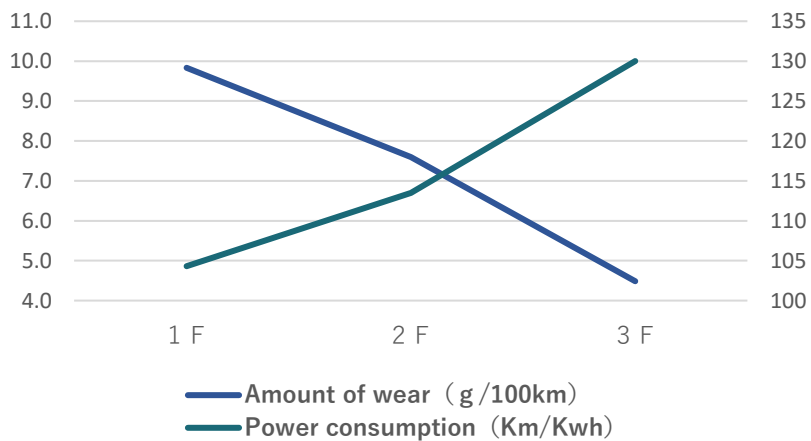


# TIRE PERFORMANCE LIPPER(NR100-18)

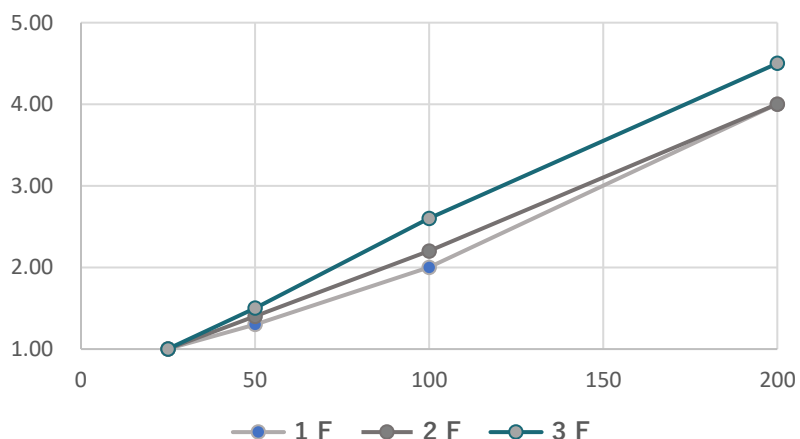
The resilience modulus is improved and compression set is reduced as shown in the table below. In running tests of 3F 5.5" E-scooter solid tires with 16% addition of this bio-rubber reinforcement, the amount of wear was reduced by about 50% and the driving distance was increased by about 25%.

1F --- Bio rubber reinforced material 0% (CNF ratio 0%)  
 2F --- Bio-rubber reinforced material: 8% (CNF ratio: 3%)  
 3F --- Bio rubber reinforced material 16% (CNF ratio 6%)

## Wear and Electricity Costs



## Tensile strength



## Combination Example

Tires blended with LIPPER(NR100-18) will have an increased ratio of bio-materials and a significantly decreased ratio of petroleum-derived materials.

Combination	Conventional tire	LIPPER (NR100-18) Compound tire
Natural rubber	60	35
B R	40	40
LIPPER(NR100-18)	0	32
Carbon Black	51	0
Silica	0	44
Titanium dioxide	0	5
Oil	15	15
P E G	5	5
S I 6 9	0.5	0.5
Coumarone G-90	10	10
Zinc oxide	5	5
Stearic acid	1	1
Noclac SP-N	3	3
Sunnok	1	1
Sulfur	2.1	2.1
Noxera MSA	1.5	1.5
Nocellar TS	1.2	1.2
Total	201.3	201.3

### Environmental Compounding Ratio

Environmental Indicators	Conventional tire	LIPPER (NR100-18) Compound tire
Biomaterials ratio	30%	33%
Oil origin materials ratio	56%	20%
Organic materials ratio	18%	17%
Inorganic materials ratio	6 %	30%

**LIPPER**



<http://lipper.io>

## Protects rich marine resources and contributes to CO2 reduction

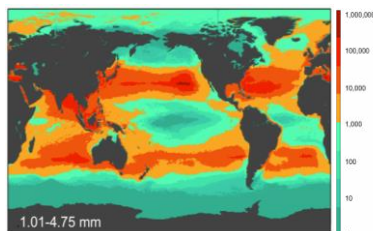
LIPPER(NR100-18) is a tire with a high biomass material ratio, which makes it strong without petroleum-derived carbon black. It also reduces environmental impact by improving biodegradability of tire wear dust.

**Microplastics**  
**80% reduction expected**  
 (5 million tons per year of tire dust)

**CO2 emissions**  
**80% reduction expected**  
 (Percentage of carbon content in tire)

Exact Scope 3 emissions are under calculation.  
 We are currently in the process of obtaining certification and carbon credit support.

### Microplastic Issue TRWP : Tire Road Wear Particles



Microplastics are microscopic plastic particles measuring less than 5 mm in diameter. 53% of microplastics found in the oceans are reported to have originated from tires.

In 2018, the European and American Gastroenterological Associations announced that microplastic fragments are being consumed by humans via marine organisms.



#### Movement to initiate regulation

In Europe, new regulations are being introduced due to concerns about environmental impact. The European Commission has already indicated plans to establish new regulations addressing dust from tire wear.

- Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea
- Marcus Eriksen Laurent C. M. Lebreton [...](#) Julia Reisser
- A Rainbow Runner in the North Pacific Gyre that had ingested 18 pieces of plastic (2008). Credit: Dr. Marcus Eriksen Gyres Institute



# Global Target: Contribute to the SDGs

We are committed to working towards the achievement of the SDGs by improving the environmental performance of tires.

## Goal 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

Ensure sustainable consumption and production patterns

## Goal 13: CLIMATE ACTION

Take urgent action to combat climate change and its impacts

## Goal 14: LIFE BELOW WATER

Conserve the oceans and marine resources for sustainable development; and use them in a sustainable manner.

## Sustainability in the Value Chain Environmentally Conscious Procurement

In procuring raw materials for tire production, we are committed to environmentally friendly procurement.

1. Actively promote afforestation projects while protecting and nurturing forest resources
2. Avoid use of illegally logged timber
3. Ensure traceability
4. Actively use woody materials such as lumber left over from lumbering, thinning, and house demolition
5. Cooperate with wood-related business entities registered under the Clean Wood Act

### CONTACT

Lipper Corporation Mie Laboratory  
Masaru Kimura  
kimura@lipper.io  
599 Miyamoto, Itaka-cho,  
Matsuzaka-shi, Mie, JAPAN 515-1614  
+81 598 67 6689

**LIPPER**