

# CNF Expanding the Potential of Bioplastics

CNF, which enables both a shift away from petroleum-based plastics and enhanced product performance, has become an essential material for the future of plastics. Here, we present concrete examples in which CNF reinforcement brings new possibilities to bio-based materials, such as bio-based polyethylene (Bio-PE) that significantly reduces CO<sub>2</sub> emissions by utilizing plant-derived carbon, and biodegradable plastics that maintain strength while promoting degradation..



New materials that dramatically  
improve environmental performance

**Bio-PE** + **CNF** = Significant CO<sub>2</sub> reduction  
through the power of plants

**Biomass polyethylene**

By combining plant-derived biomass polyethylene (Bio-PE) with CNF, high-performance plastics with low CO<sub>2</sub> emissions are developed. This approach aims to replace plastics derived from fossil resources.



Increased degradation speed while maintaining strength

**Biodegradable plastics** + **CNF**

= Promotes degradation while maintaining strength  
during the degradation process

By compounding CNF with biodegradable plastics, the range of applications for biodegradable plastics expands, enabling new manufacturing that achieves both environmental performance and product performance.

## CNF-reinforced Bio-PE products, prototypes



Number tag (Kamiyama, Ltd)



Rice bowl (UNION SANGYOU CO., LTD)

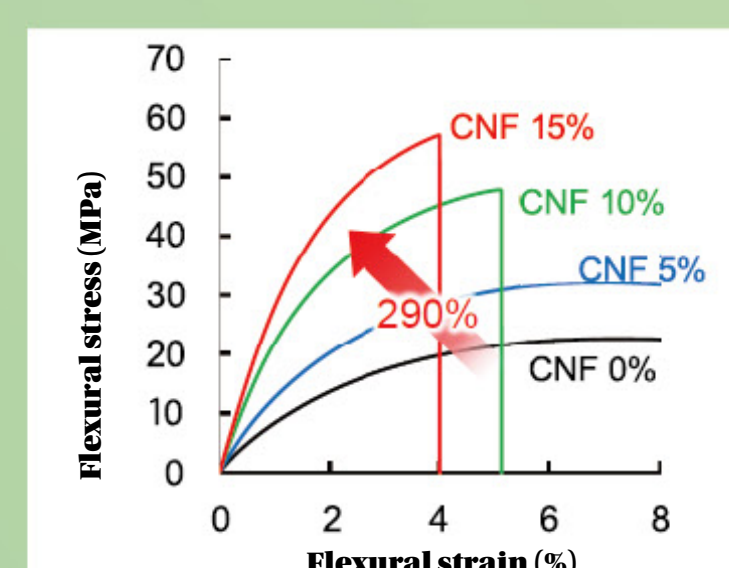
Performance data

**Flexural modulus**

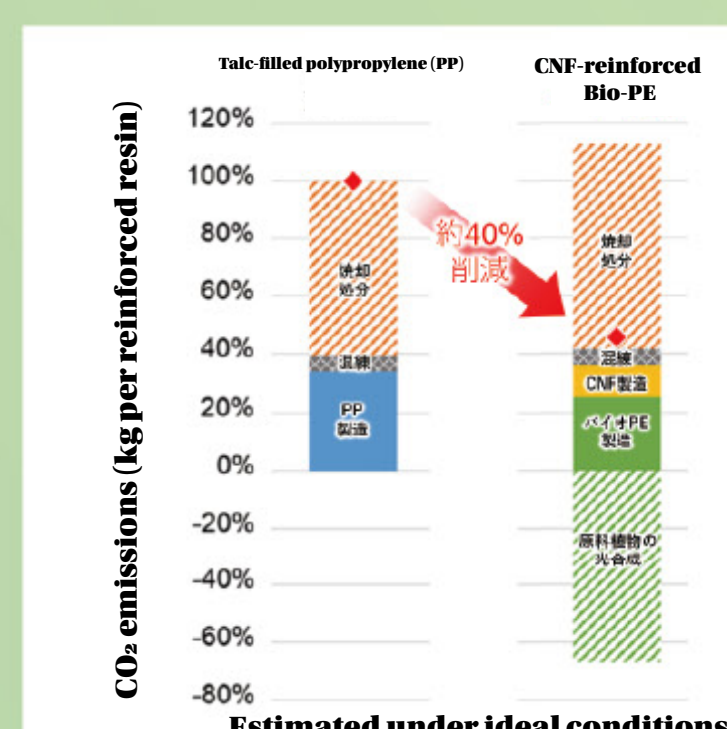
CNF 0% 1110 MPa → 290% UP → CNF 15% 3220 MPa

**Heat deflection temperature (1.80 MPa)**

CNF 0% 47.1 °C → 61.2 °C UP → CNF 15% 108.3 °C



## CO<sub>2</sub> emission reduction potential



Compared with talc-filled polypropylene (PP), CNF-reinforced Bio-PE can reduce CO<sub>2</sub> emissions by approximately 40%.

Toward environmentally  
oriented product branding

Performance data

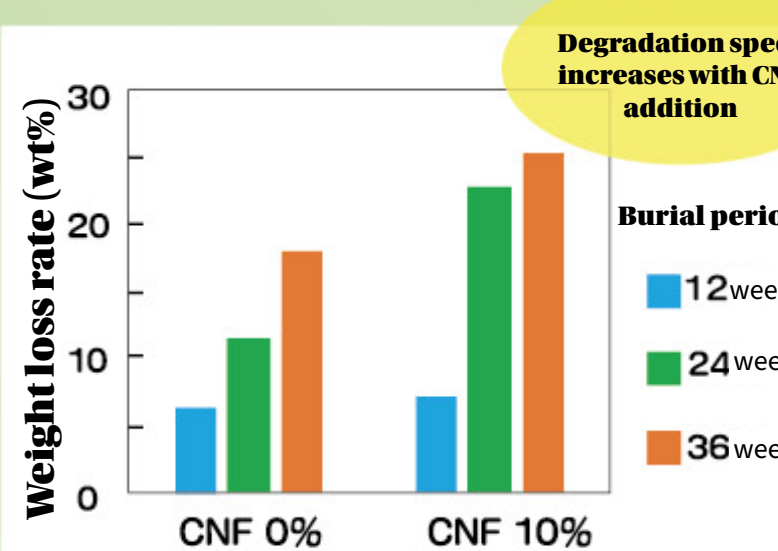
<Flexural modulus and biodegradability of PBS with 10% CNF>

CNF 0% 270 MPa → 540% UP → CNF 10% 1450 MPa → 24週 1500 MPa → 36週 780 MPa

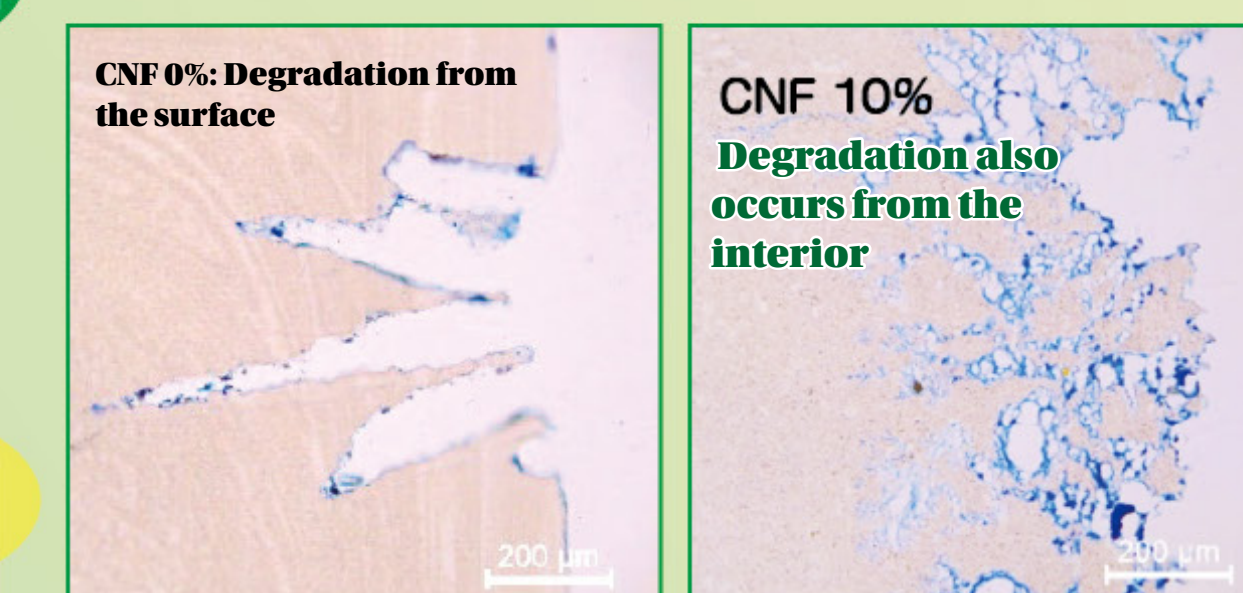
Appearance before and after soil burial



Weight change due to soil burial



**Optical microscope images**



※ Microorganisms observed after blue staining

Materials with 10% CNF addition show approximately three times higher flexural modulus compared to materials without CNF. Furthermore, even after soil burial, CNF functions as a structural framework, maintaining strength for a certain period while accelerating degradation.

If you are interested in CNF, please feel free to contact us.

