Development of Multi-Lock Biopolymers Degradable in Ocean From Non-Food Biomasses

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KUREHA CORPORATION

Development of strong and degradable biopolymers for fishing nets

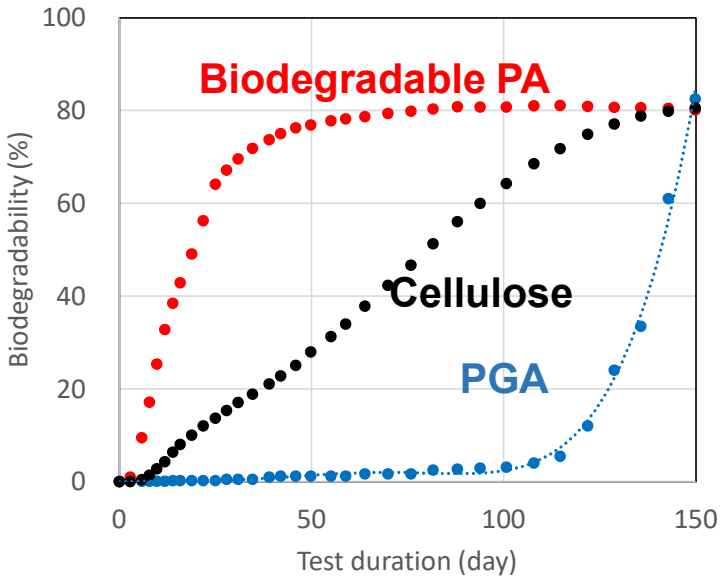
MS伊藤PJ

Application of biodegradable polymers towards marine plastic pollution have been investigated. However, there are still remain many problems, for example, the degradation of one of the polymers are quite low in the ocean.

Biodegradable polyamide (PA) and polyglycolic acid (PGA) degrade in sea water and they have extensive high mechanical strength associated with high concentration of amide group or ester group.

Degradation product of biodegradable PA is amino acid (AA) and that of PGA is glycolic acid (GA). AA and GA exist in natural environments so the impact of them to marine environment is assumed very small. In this project, we develop strong and degradable biopolymers based on PA and PGA for fishing gears.

Biodegradation in sea water (ISO19679)



Degradation of PGA ball

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➢This project

- **Develop a strong and degradable biopolymer for fishing nets**

➢ Development direction

- Modifying polyamide 4 (PA4) and polyglycolic acid (PGA) as biodegradable base resins for fishing gears

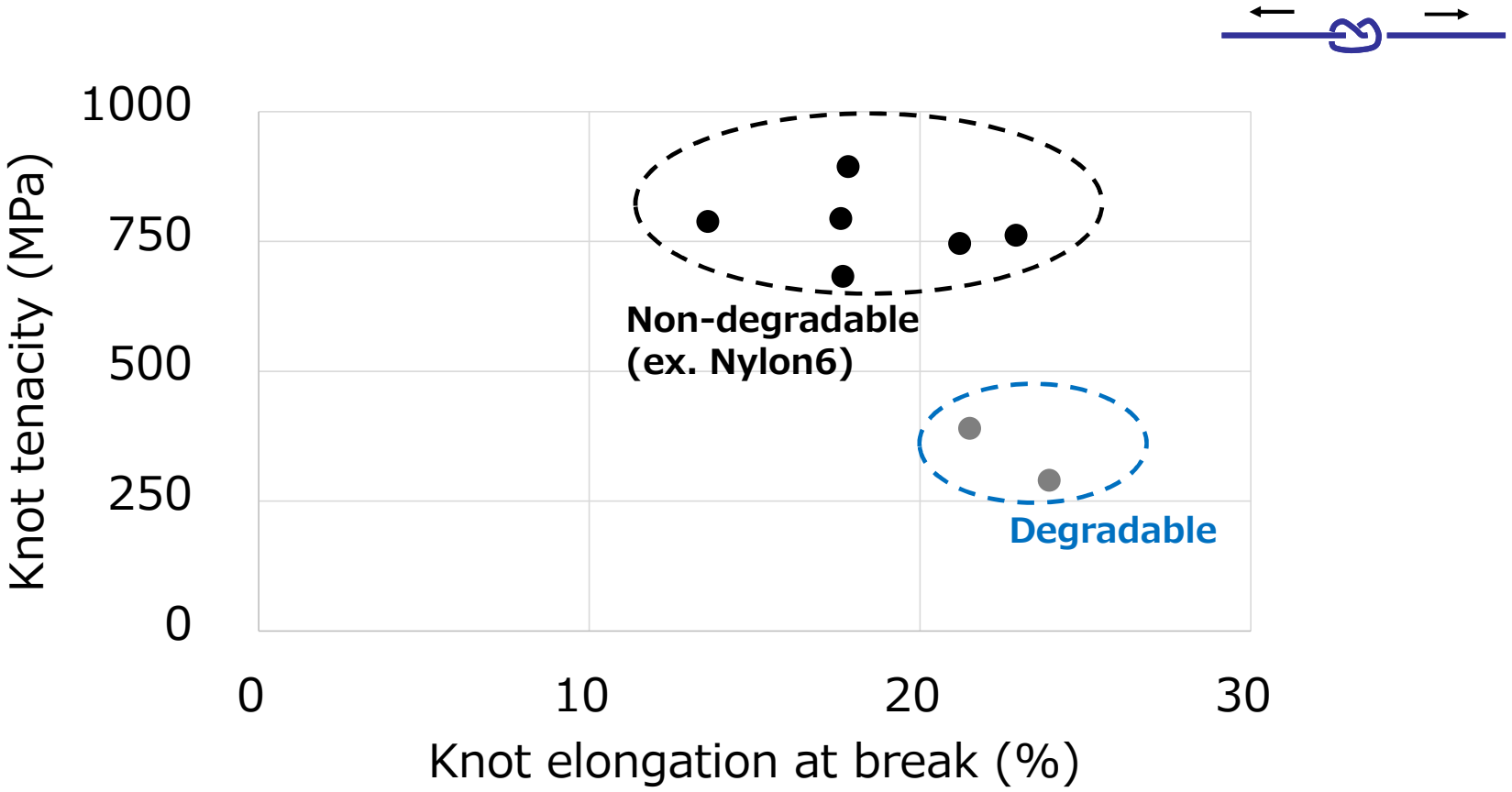
➢ Project goals

- To achieve the biodegradability of fishing gears discharged to sea while maintaining physical properties in use
  (The target percentage of biodegradation is 80% within 3years)

- To develop method for producing low cost monomer from non-food biomasses
  (The target cost is hundreds of yen per kg)

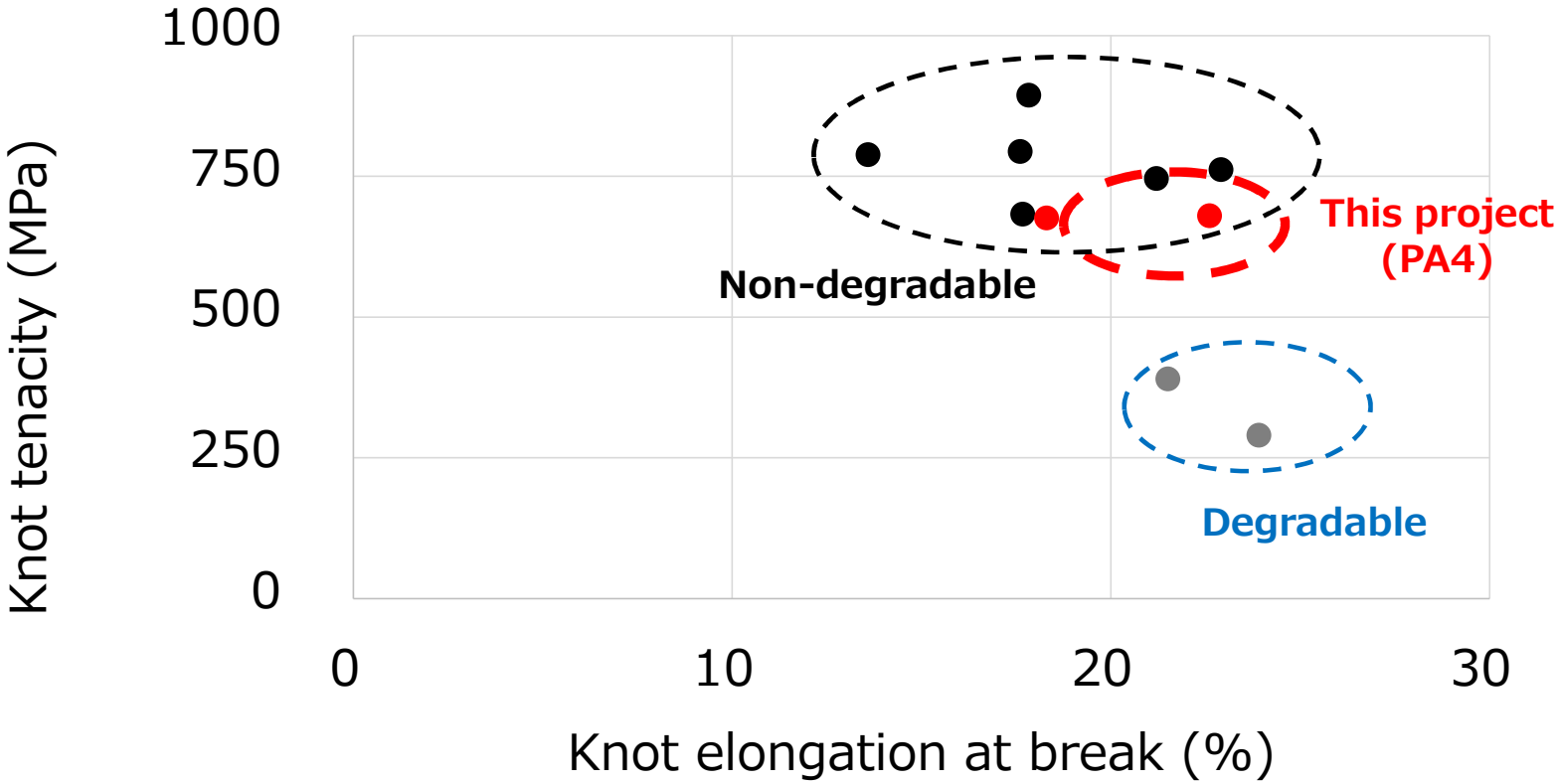
- To satisfy various properties required as fishing gears by developing manufacturing methods and controlling higher-order structures
  (The target is about the same of Nylon 6)

➢ The knot tenacity and elongation of non-degradable and degradable ones



✓ Degradable fishing lines are inferior to knot strength as compared with non-degradable ones.

➢ The knot tenacity and elongation of fishing lines made of PA4

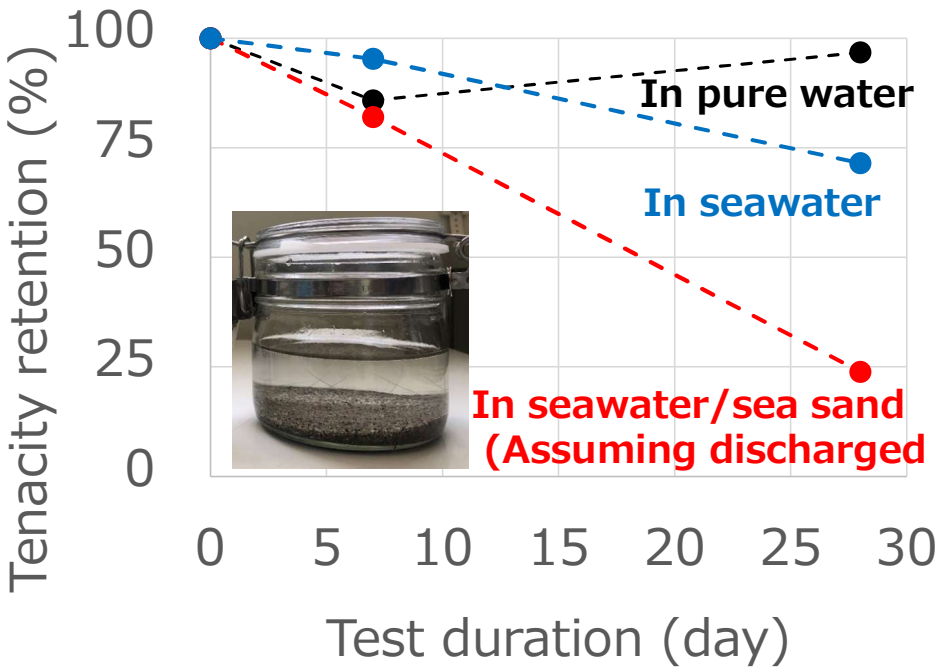


✓ By improving polymerization and melt-spinning method to control the highly ordered structure, the knot tenacity of PA4 lines are improved nearly same as that of non-degradable fishing lines.

→ To evaluate and improve practicality, real fishing test is ongoing

➢ The tenacity change during of PA4 fishing lines

(Degradation test temperature: 25degC)



Before test

After 1month (seawater)

After 1month (seawater/sand)

✓ PA4 fishing lines degrade in seawater and more quickly degrade in sea water/ sea sand condition in which assuming discharged

→ To control the degradability optimum for each use, modifying polymer structure such as copolymerization method is under study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