

Renewable materials

Возобновляемые материалы

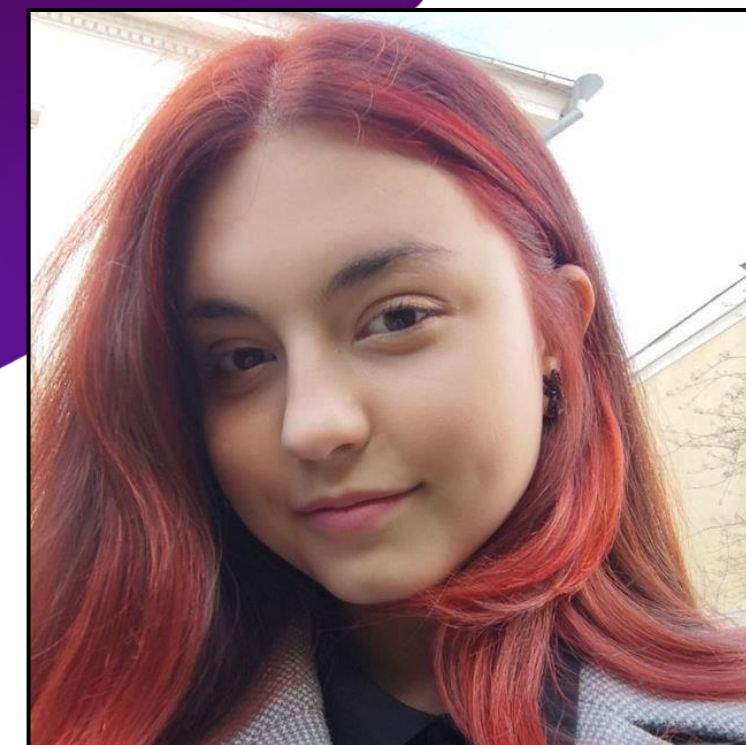
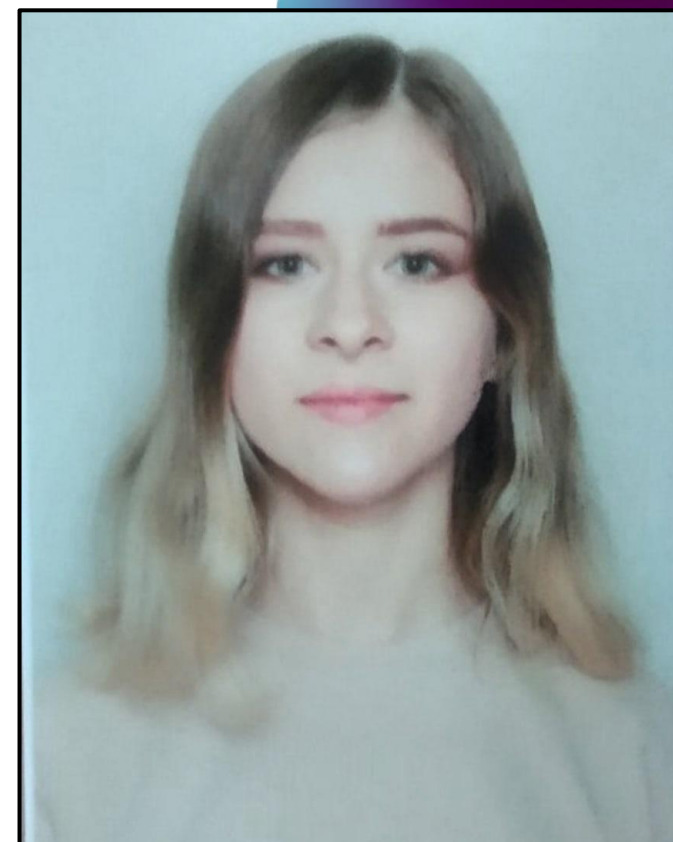
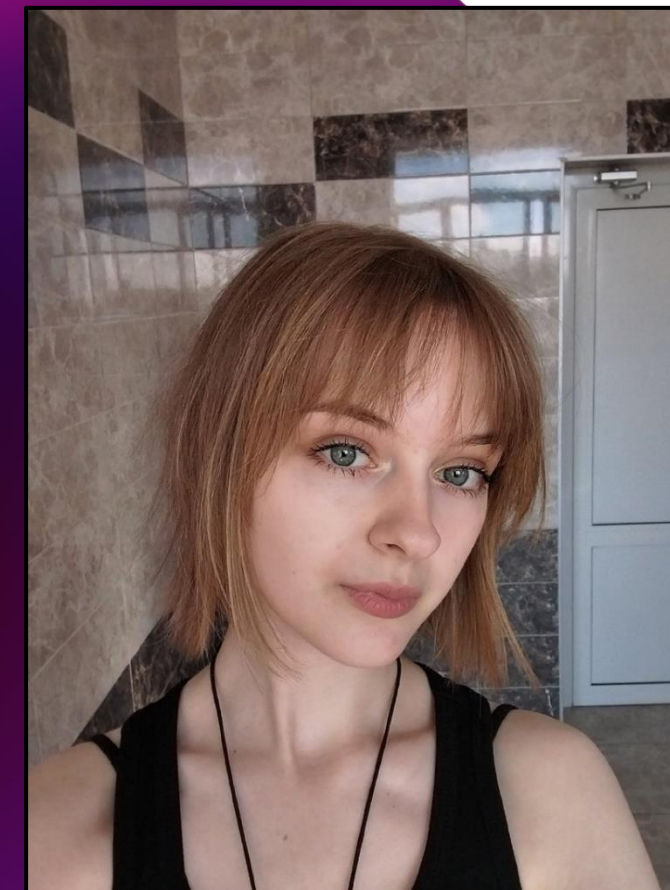
Подготовили студенты второго курса 8 группы:

Мороз Кирилл Константинович

Гусарова Диана Андреевна

Пуренок Мария Андреевна

Манкевич Екатерина Валерьевна



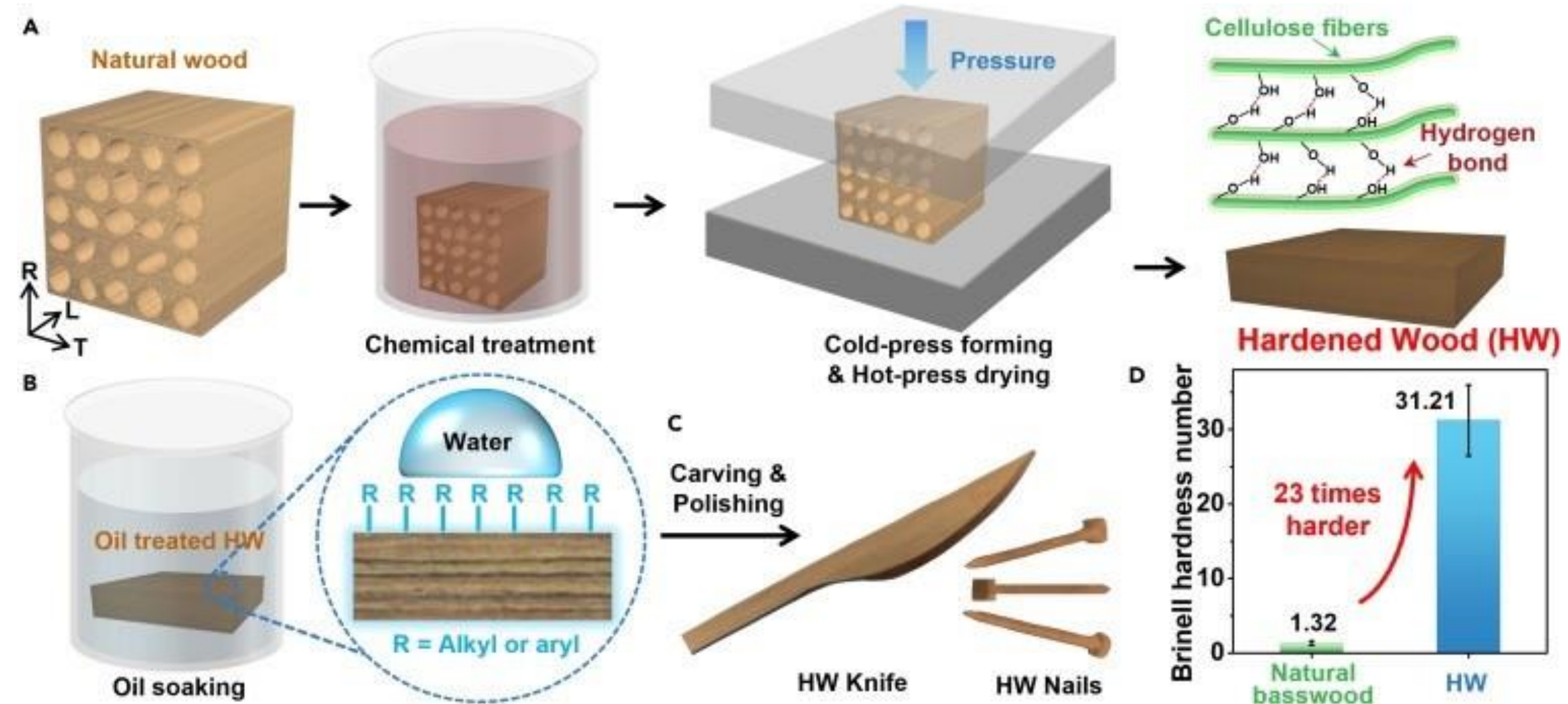
Nanocellulose as a promising raw material



- Cellulose is the major component in lignocellulosic plant biomass and is approximately 40–45% of wood by weight.
- One of the main drawbacks of nanocellulose production is difficulties in economic recovery of acids.

Hardened Wood

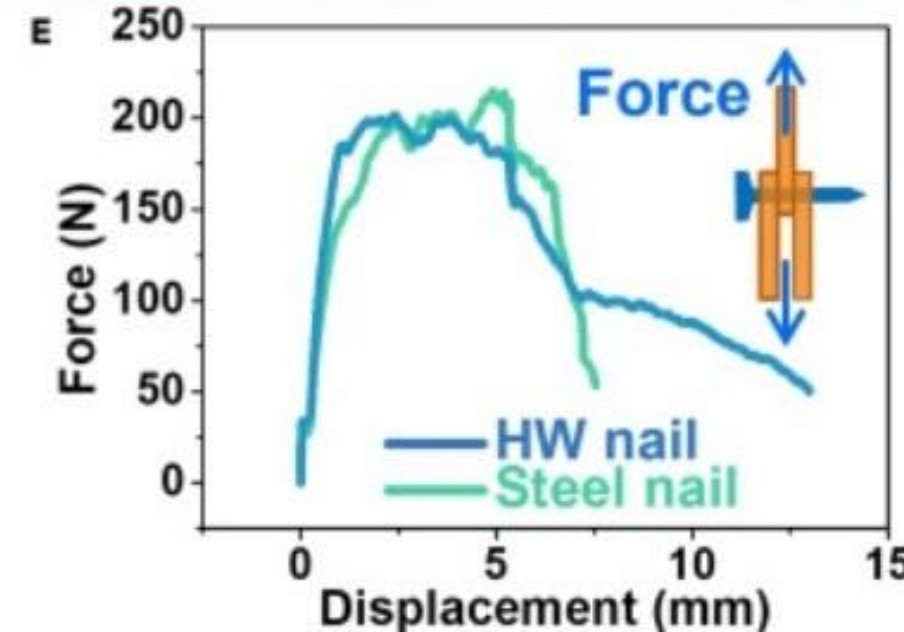
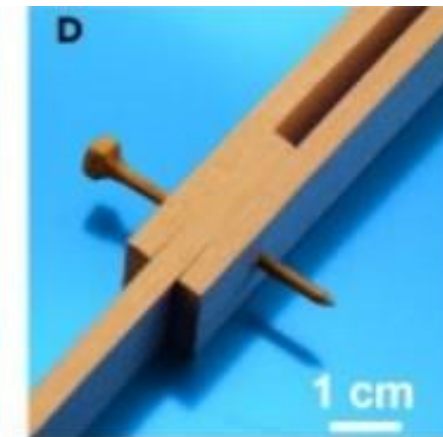
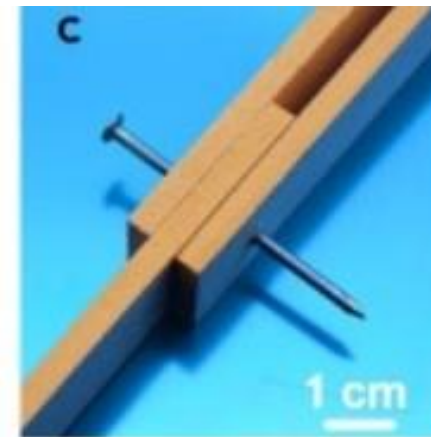
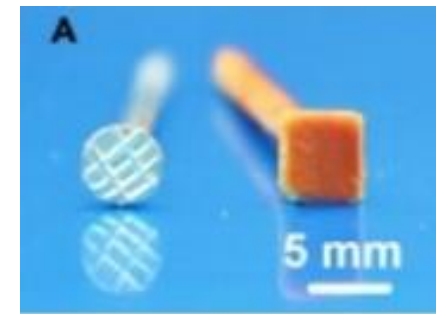
- Natural wood materials are processed into a hardened wood (HW) with a 23-fold increase in hardness.



- The HW can be processed into different shapes for various applications.
- An HW table knife can be nearly 3 times sharper than most commercial table knives.

Advantages of using HW

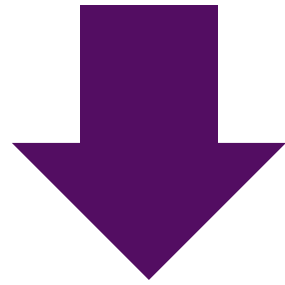
- HW has exceptional mechanical properties and is immune from the rusting problem suffered by metals, which suggests its potential as a candidate fixing material.



- An HW nail shows comparable performance with a steel nail of similar size.

Future opportunities for bio-based adhesives

Vegetable oils



adhesive

hydrophobicity

Biopolymers

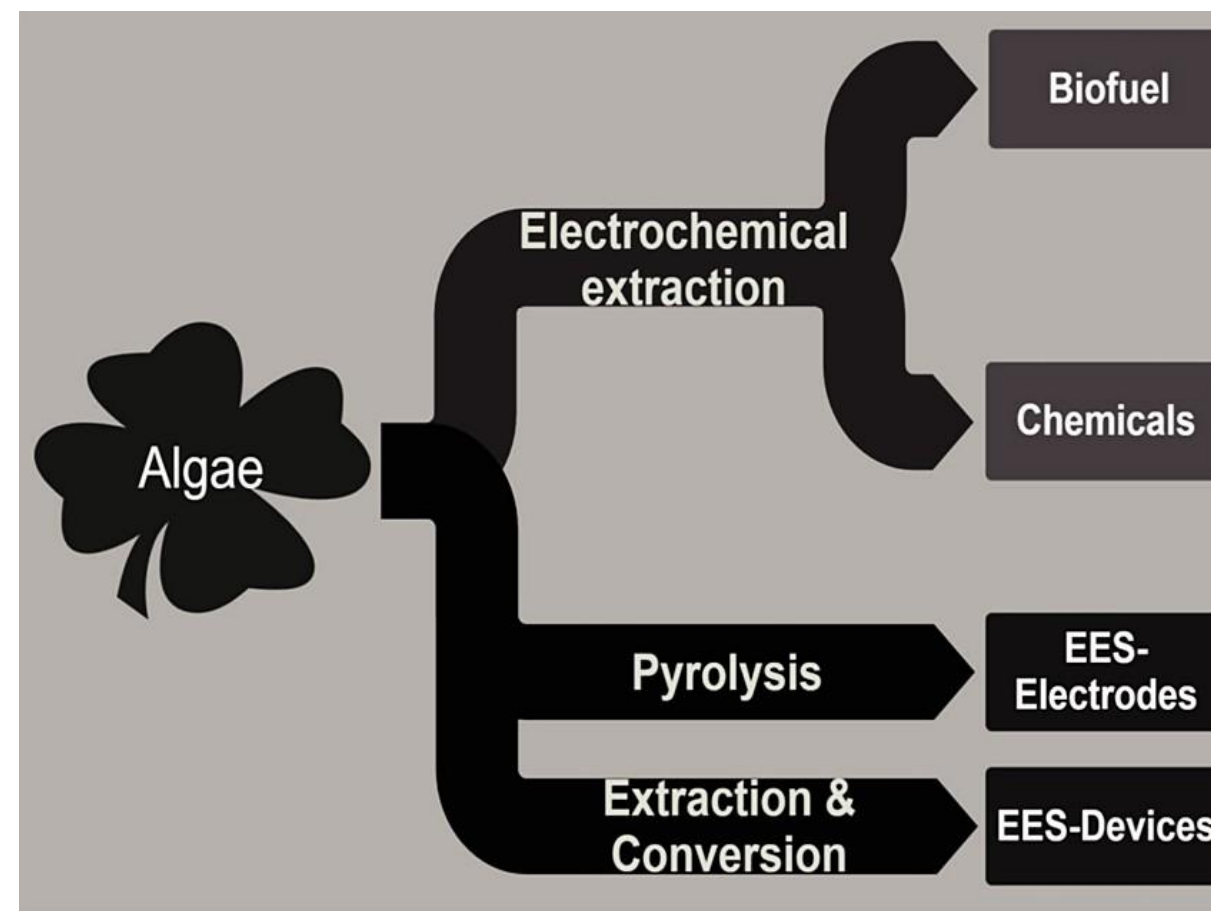
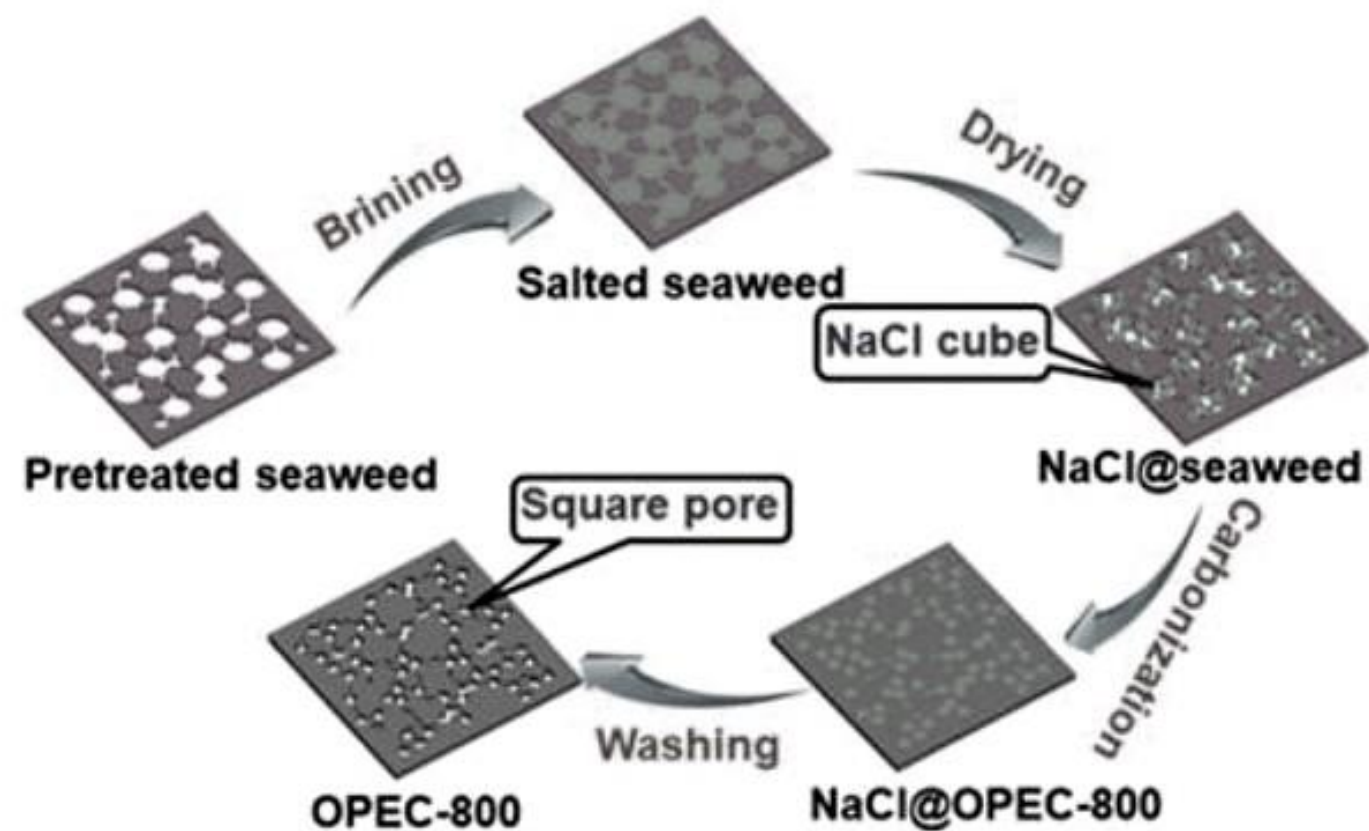
- ▶ **proteins;**
- ▶ **polysaccharides;**
- ▶ **lignin, etc.**

Monomers

itaconic acid

These building blocks can improve the performance of petroleum-based adhesives.

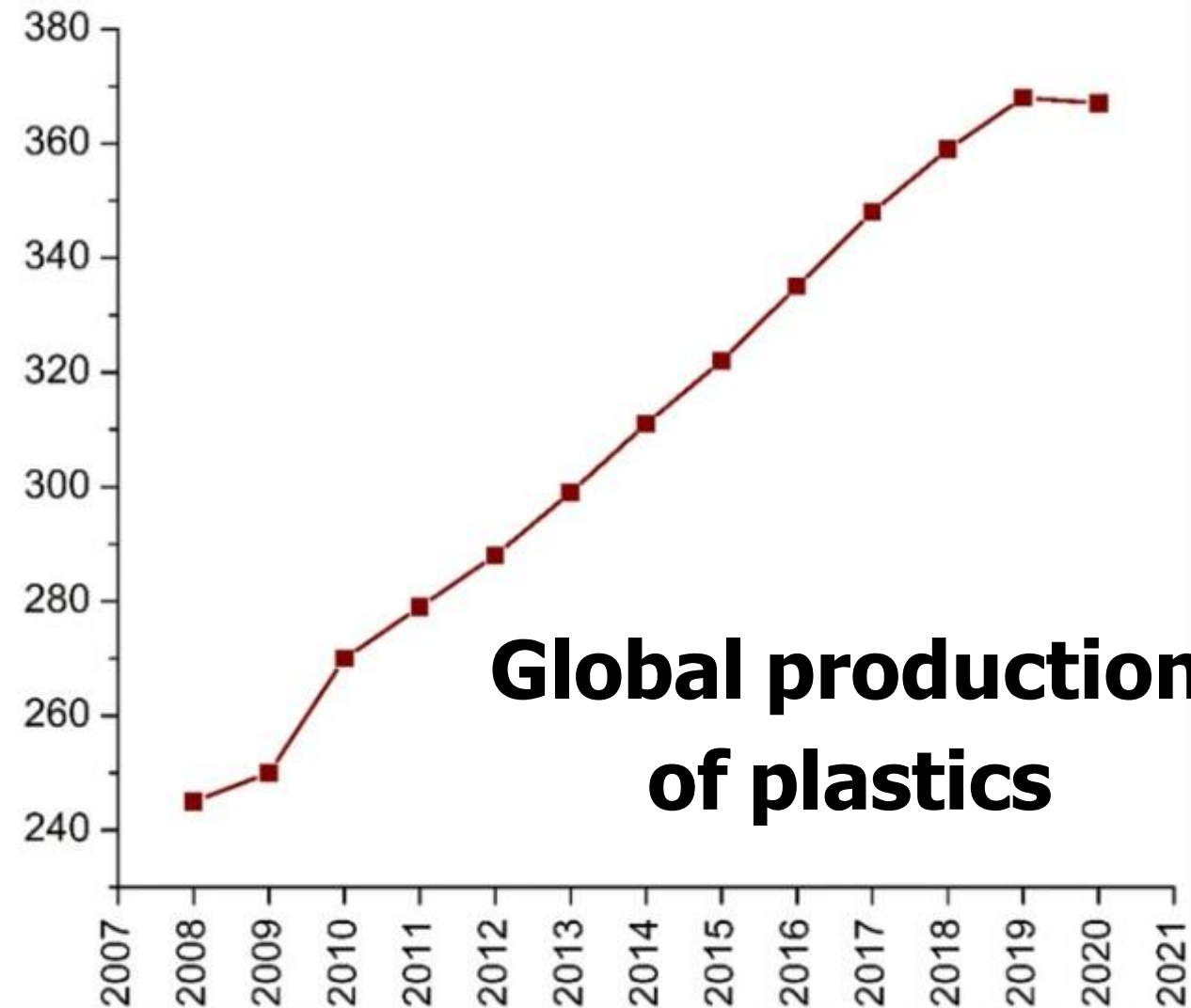
Algae-based Electrochemical Energy Storage (EES) Devices



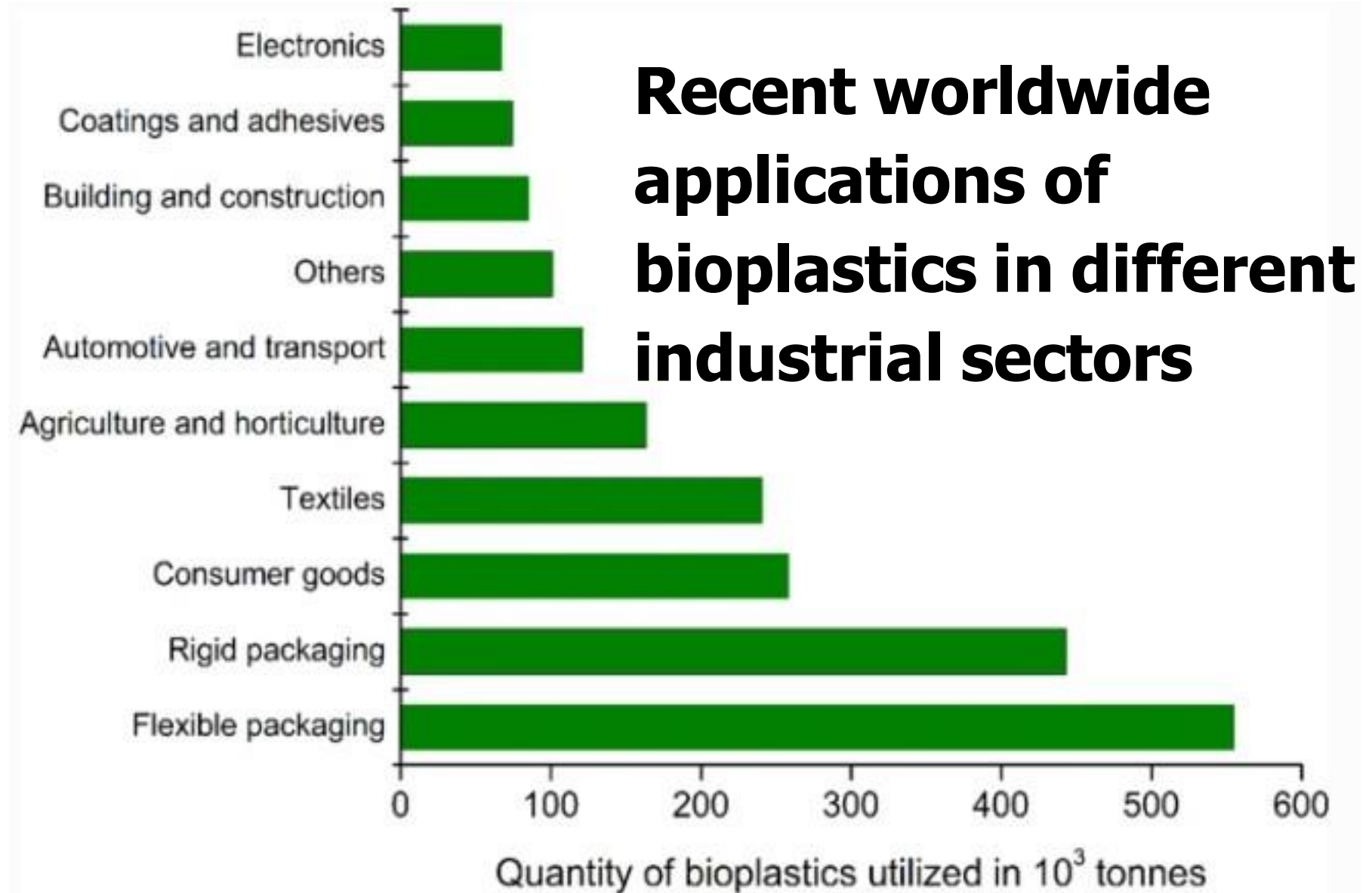
- The four main parts of the EES devices include electrode, binder, electrolyte, and membrane can be prepared from algae.
- The algae and algae-based organic materials as renewable, facile, inexpensive, and non-hazardous materials have been used to prepare EES devices.

Innovations in applications and prospects of bioplastics and biopolymers

Production volume of plastics in million tonnes



Global production of plastics



Recent worldwide applications of bioplastics in different industrial sectors

- The specific conditions required for the biodegradation of bioplastics such as temperature, pH and humidity cannot be necessarily achieved in landfills for near-complete composting of bioplastics.

To sum it up...

- 1. Today, the use of plant biomass is one of the most promising future directions, owing to the diversity of vegetation and refining methods that allow us to vary the properties of obtained substances.**
- 2. Despite numerous developments, full-fledged environmentally friendly production on a large scale has yet to be implemented.**
- 3. The establishment of specific sites for the disposal of bioplastics necessitates a number of different factors.**

The sources

- 1. Wood-Derived Materials for Green Electronics, Biological Devices, and Energy Applications / H. Zhu [et. al.] // Chemical Reviews. – 2016. – №16. – P. 9305-9374.**
- 2. Hardened wood as a renewable alternative to steel and plastic / B. Chen [et. al.] // Matter. – 2021. – №12. – P. 3941-3952.**
- 3. Heinrich, L. A. Future opportunities for bio-based adhesives – advantages beyond renewability / L. A. Heinrich // Green Chemistry. – 2019. – №8. – P. 1866-1888.**
- 4. Parsimehr, H. Algae-based Electrochemical Energy Storage devices / H. Parsimehr, A. Ehsani // Green Chemistry. – 2020. - №23. – P. 8062-8096.**
- 5. Innovations in applications and prospects of bioplastics and biopolymers: a review / S. Nanda [et. al.] // Environmental Chemistry Letters. – 2021. – №20 – P. 379-395.**