The role of 3D printing towards net zero

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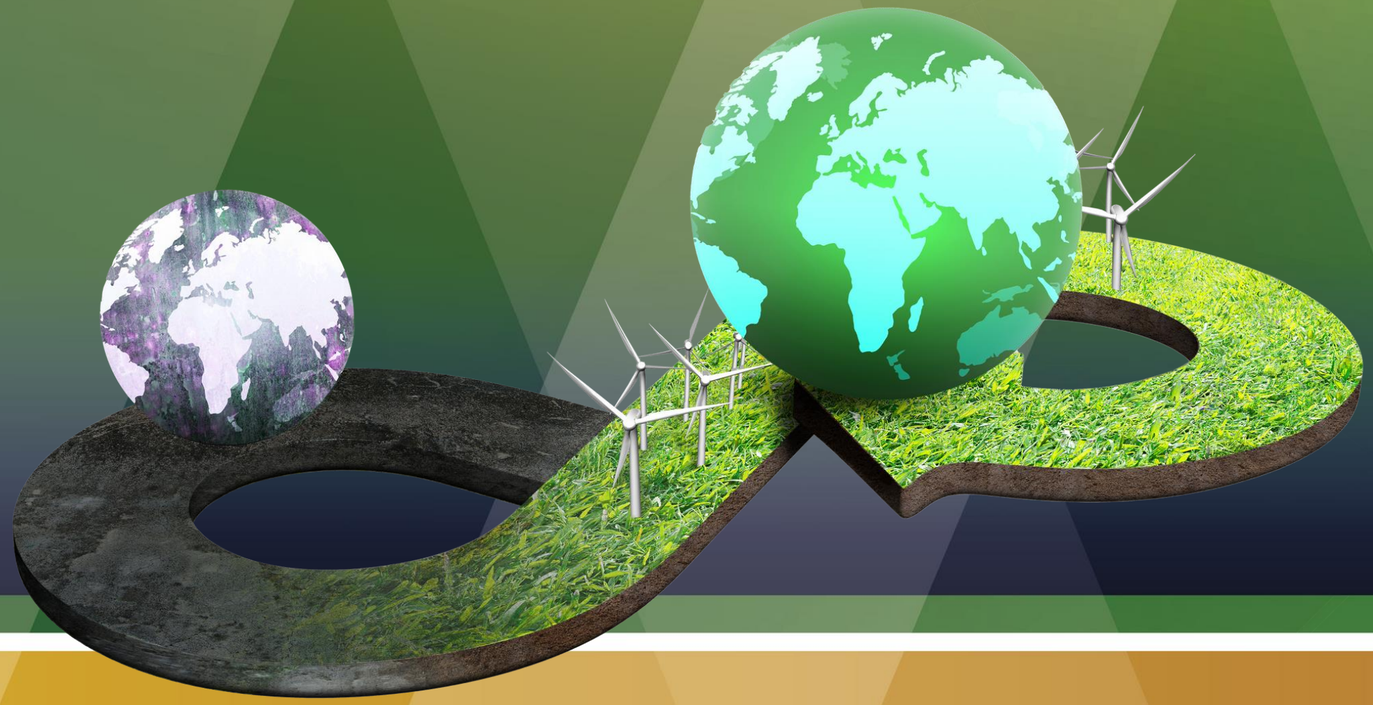
30 November 2022



Additive Manufacturing

“process of joining materials to make parts from 3D model data, usually layer upon layer” [1]

- Broader term
- Addition of material
- Industry

[1] *Standard ISO/ASTM 52900:2021*

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3D printing

“fabrication of objects through the deposition of a material using a print head, nozzle or another printer technology” [1]

- Part of AM
- Layer by layer deposition
- Non-technical

How 3D printing aligns with net zero?

Material usage

Less waste in comparison with subtractive processes

Energy consumption

Less manufacturing and processing steps

Topology optimisation

Lighter parts that use less material and save energy

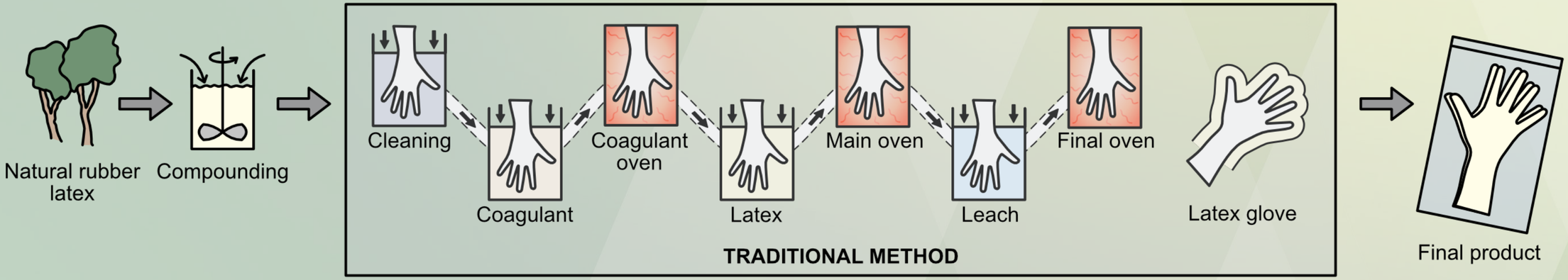
On-demand manufacturing

Flexibility, quick adaptation and reductions in inventory

Decentralisation

Reduction of CO_2 emissions due to transportation

Traditional manufacturing of gloves



Synthetic rubber

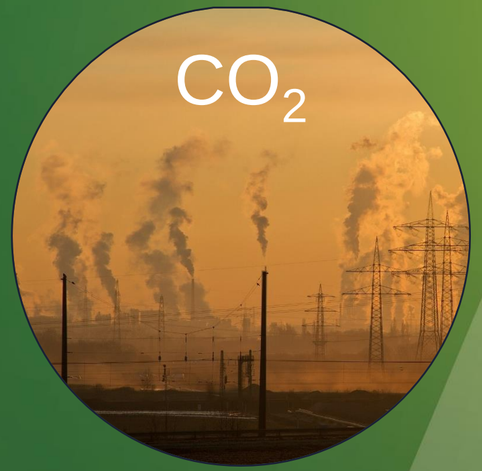
Emission 25 kg CO_2 equivalent/box

Production of rubber + Manufacturing of gloves

Absorption 100 kg CO_2 equivalent/box

Natural rubber

**Study by Nurkhairunisa Afiqah Salim Musa (Cranfield University)*

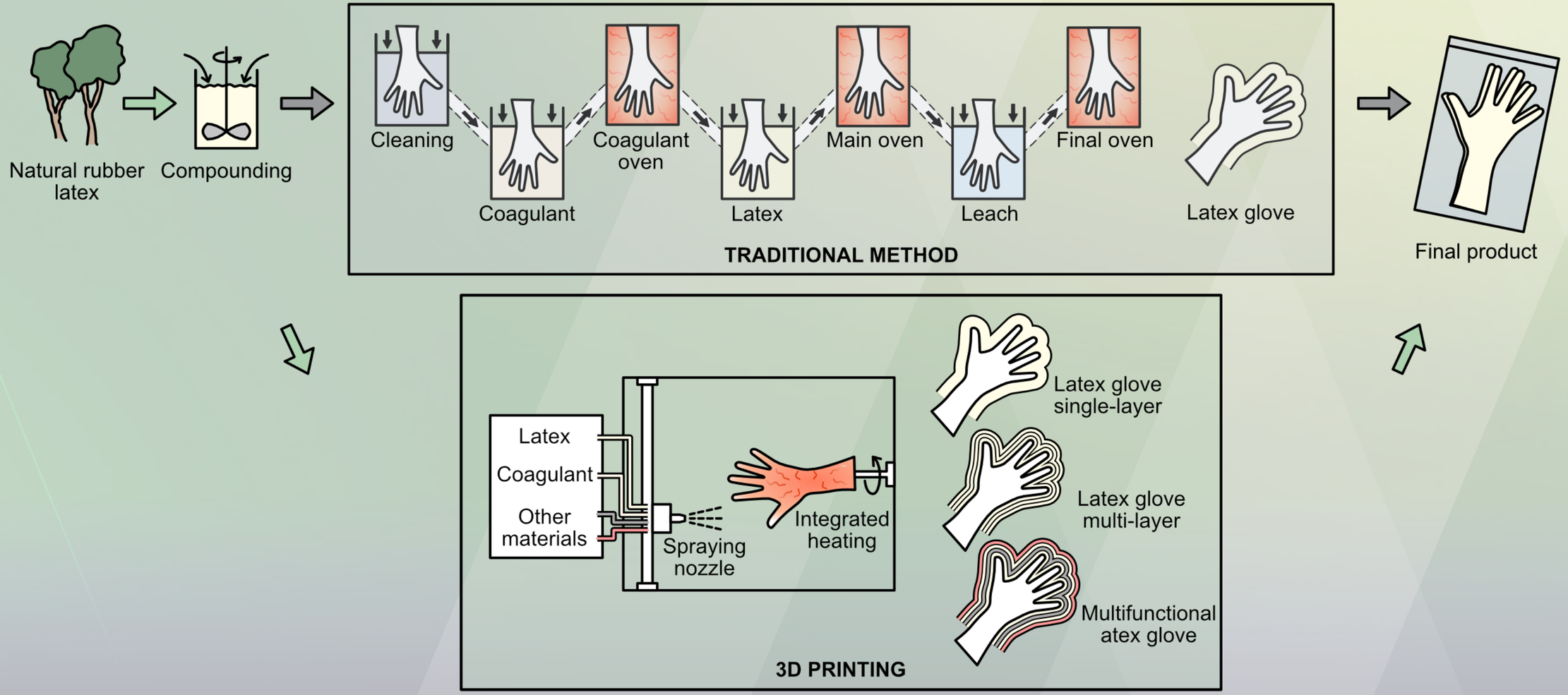


Absorption 100 kg CO_2 equivalent/box

Car emissions: 200 g CO_2/mi

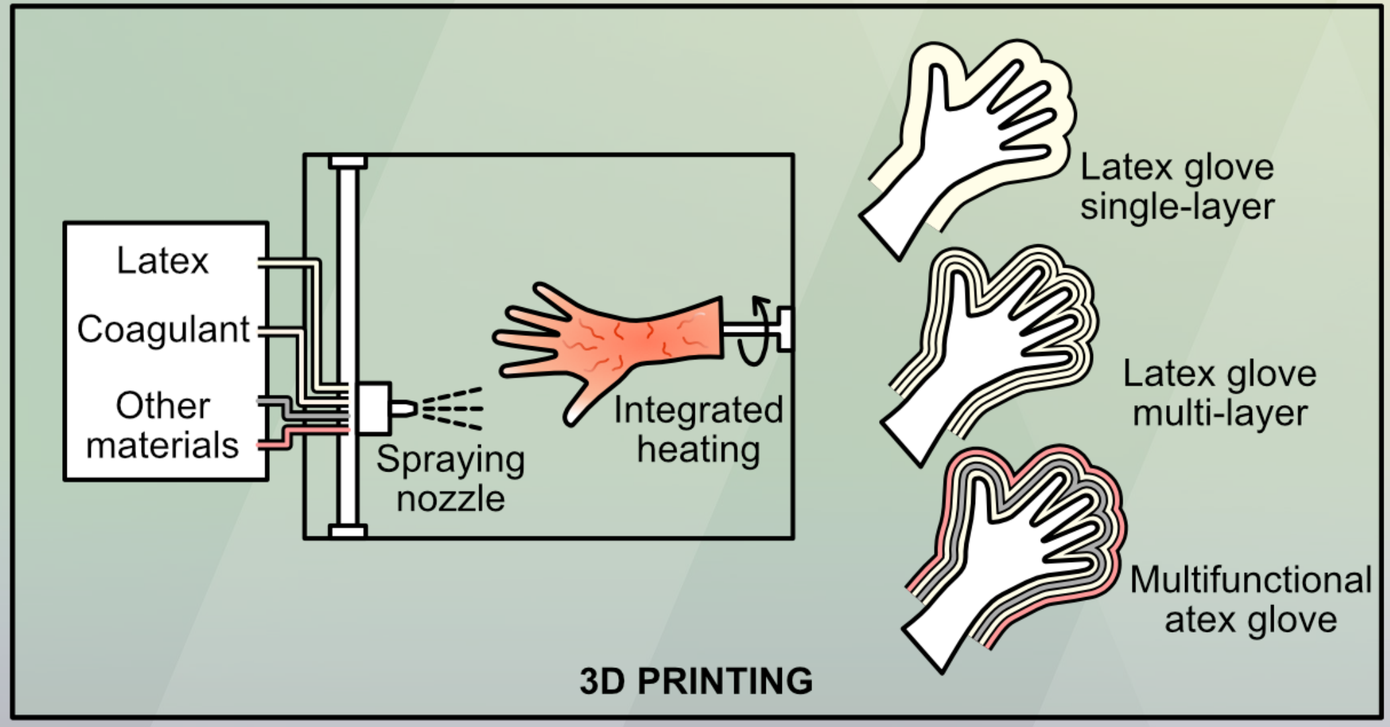
1 box compensates 500 mi

Traditional manufacturing vs 3D printing of gloves



Video: Cutting edge sustainable production of rubber gloves - YouTube

3D Printer for Elastomeric Products
or
3D-PEP



How 3D-PEP aligns with net zero?

Material usage

Less waste, just depositing material needed

Energy consumption

Factories 10 times smaller for same production

Topology optimisation

More control over the deposition of the material

On-demand manufacturing

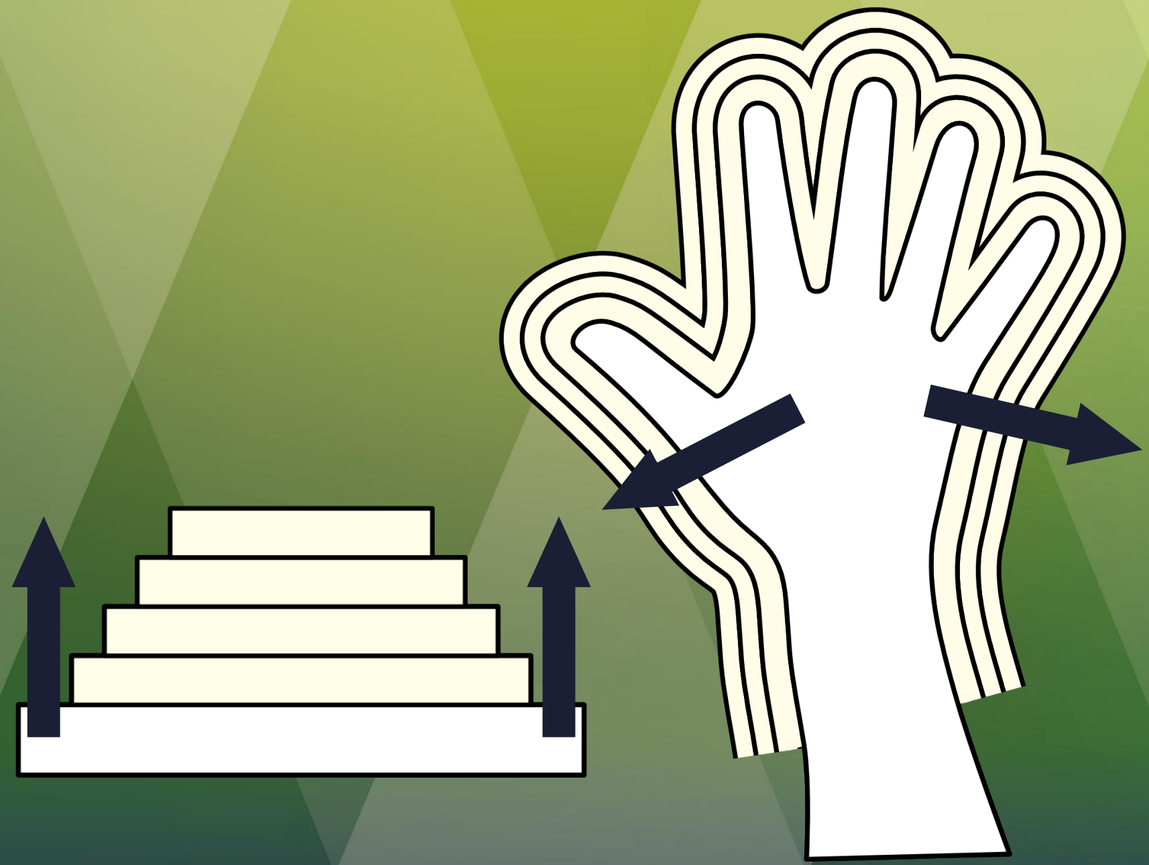
Flexibility, quick adaptation and reductions in inventory

Decentralisation

Reduction of CO_2 emissions due to transportation

Is 3D-PEP really 3D printing?

*“**fabrication of objects** through the **deposition of a material** using a print head, **nozzle** or another printer technology”*[1]



[1] *Standard ISO/ASTM 52900:2021*

Dipping

- Limited control over the deposition

3D-PEP

- **Control over the deposition process**
- **Free-standing objects**

Spraying

- Coating remains attached substrate

in the press

How a new type of glove can reduce environmental damage
https://www.bbc.co.uk/news/av/health-55023413

Sustainable production of rubber gloves
https://www.youtube.com/watch?v=17Ku_en_Jdg

Research advances sustainability in surgical latex glove manufacturing
https://www.cranfield.ac.uk/press/news-2020/research-advances-sustainability-in-surgical-latex-glove-manufacturing

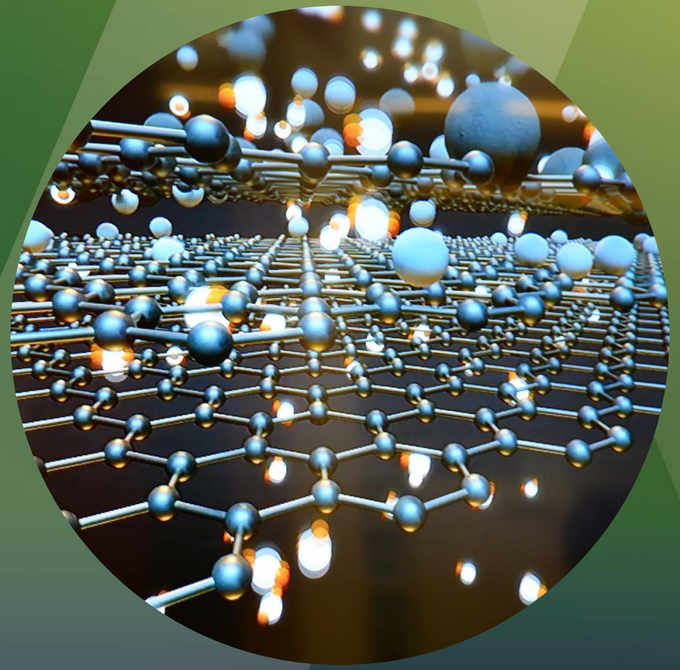
COVID-19 prompts pivot to green alternative to rubber gloves
https://news.trust.org/item/20201124162116-pfj3b/

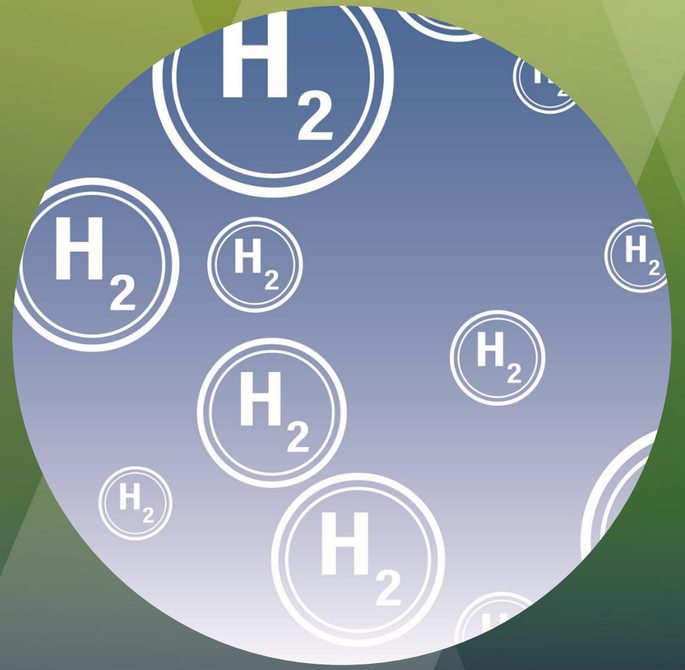
These biodegradable gloves provide a green alternative to synthetic rubber
https://www.weforum.org/agenda/2020/11/covid-19-prompts-pivot-to-green-alternative-to-rubber-gloves/

Cutting edge sustainable production of rubber gloves
https://www.youtube.com/watch?v=NYe3zOdV1pM

New modular manufacturing process for latex rubber gloves on course for net zero
https://blogs.cranfield.ac.uk/manufacturing/new-modular-manufacturing-process-for-latex-rubber-gloves-on-course-for-net-zero/

Cranfield AeroSpace Balloon project





Opportunities for AeroSpace Balloon

- Weather monitoring
- Space tourism
- Sustainable delivery satellites

Thank you

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