UD-SPACE

Space Research at the University of Debrecen

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Space research challenges, tasks

- Cosmic rays
 - Radiation protection of astronauts & space equipment
 - Space weather
- Long lasting spaceflight
 - O_2 production, CO_2 elimination
 - Proper feeding
 Nutrient composition, enjoyment
 - Growing plants
 - Water and nutrient-recirculation
- Effect of microgravity on astronauts
 - Skeletal system, muscles, cardiovascular system, psychic changes
- Using data from Space
 - Remote sensing, GPS, astronomy







Aerogels

General properties:

- Solids: rigid or flexible
- Open mesoporous structure
- High porosity (90–99%)
- High specific surface area (400–1000 m²/g)
- Low density (0.5–0.03 g/cm³)
- Inorganic, organic, biopolymer, hybrid and composite solid backbones



Polyimide and Polyamide aerogels

Space applications:

- Thermal insulation (low / medium / high temperature)
- Radiation / impact shielding
- Electrical insulation

Key characteristics:

- Mechanical properties
- Conductivity (th.; el.)
- Optical properties (IR)



Absorption of humidity

Hydration induced structural changes

Crop structure maps using satellite data



Sentinel-2 cut

Annotated image green: wheat, blue: barley, red: rape, yellow alfalfa



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Artists view of a Lunar/Martian base



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BIODROME DEBRECEN SPACE PLANT RESEARCH PROGRAM PAYLOAD DEVELOPMENT: HUNOR PROGRAM

BIODROME



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Effect of microgravity on skeletal muscle differentiation

Random Positioning Machine





Normal gravity



Microgravity

MYH2: Cy3

Nuclei: 🛛









Solar physics observatory rehabilitation

