Switchable adhesives for carpet tiles

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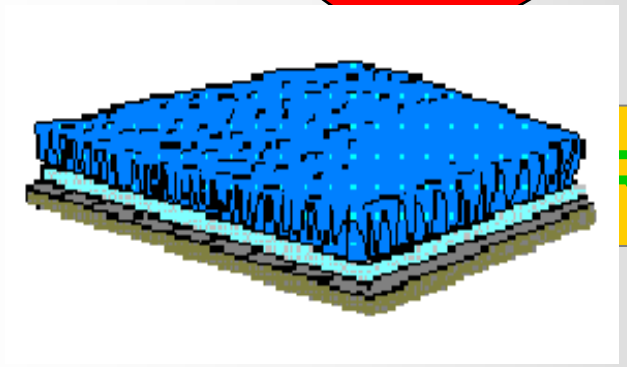
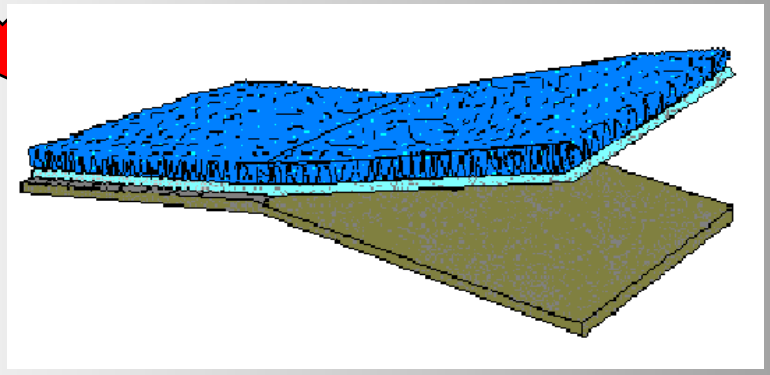
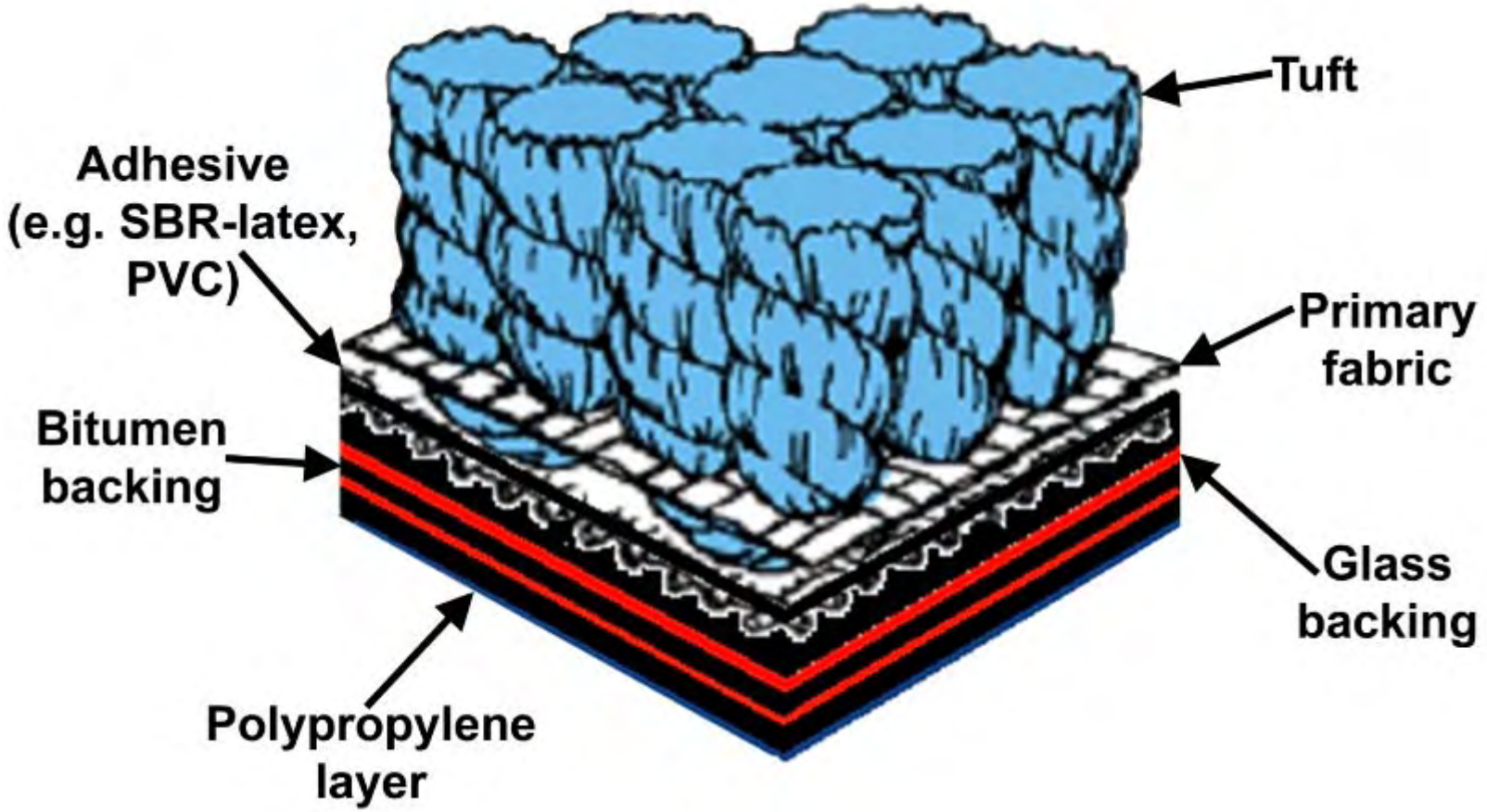
Background



RECYCLABLE



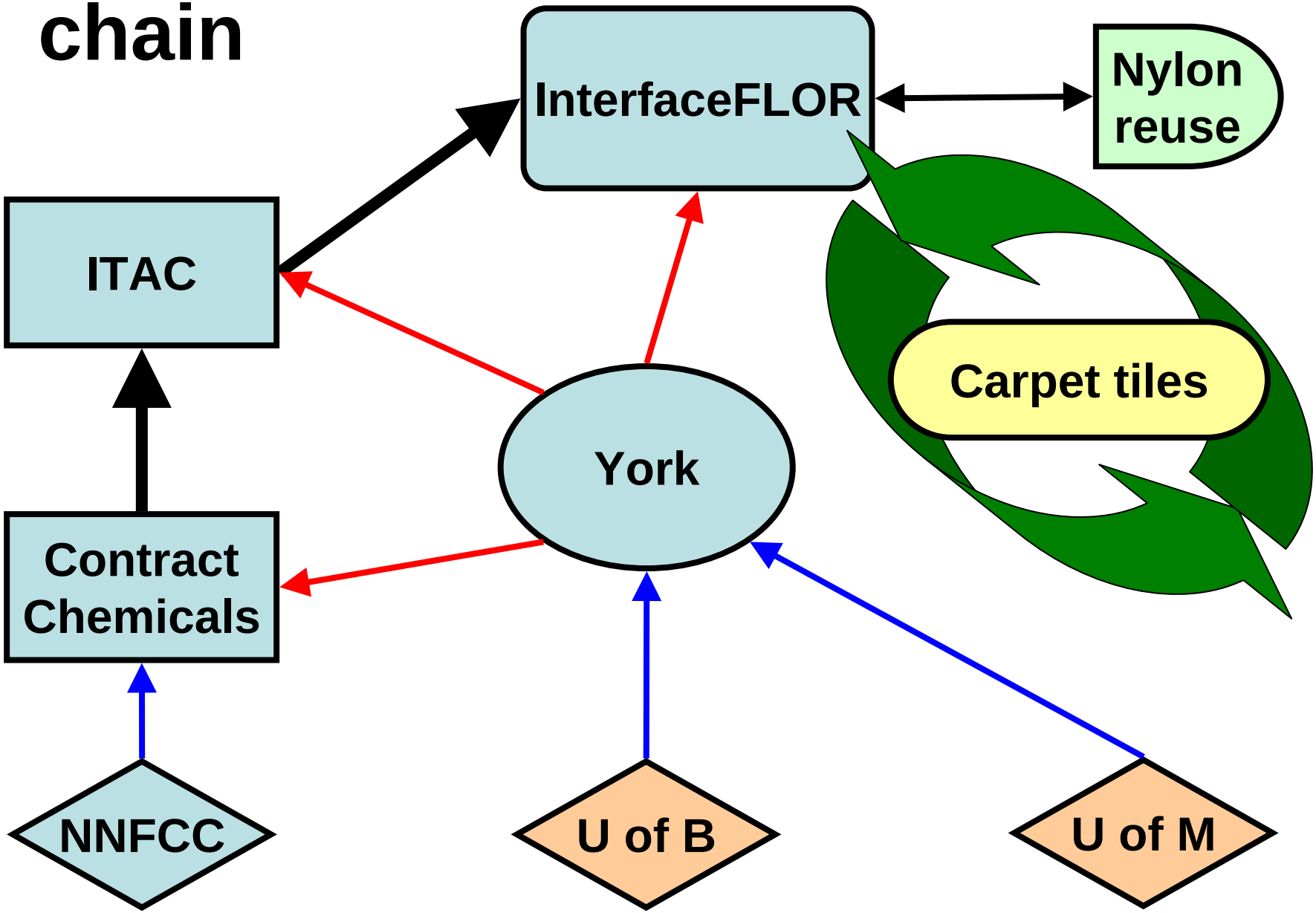
Typical Carpet tile



History & project goals

Year	2003 - 2006	2007	2008-9	2009-10	2010-11
Project year	**I - III**	**IV**	**1**	**2**	**3**
Activities	PhD project	Feasibility study	Scale up & reduce manufacture costs	Pilot scale: 100k m^2 $year^{-1}$	Industrial scale: 4 M m^2 $year^{-1}$
Commercial benefit	Reduce use & need for virgin material – lower cost long term				
Sustainability benefit			• Reduce non-renewable resources • Reduce impact of adhesive application – hot-melt • Nylon recycling – eliminate a large source of NOx very high GWP. • Zero waste during project		

Supply chain



Starch

ADVANTAGES

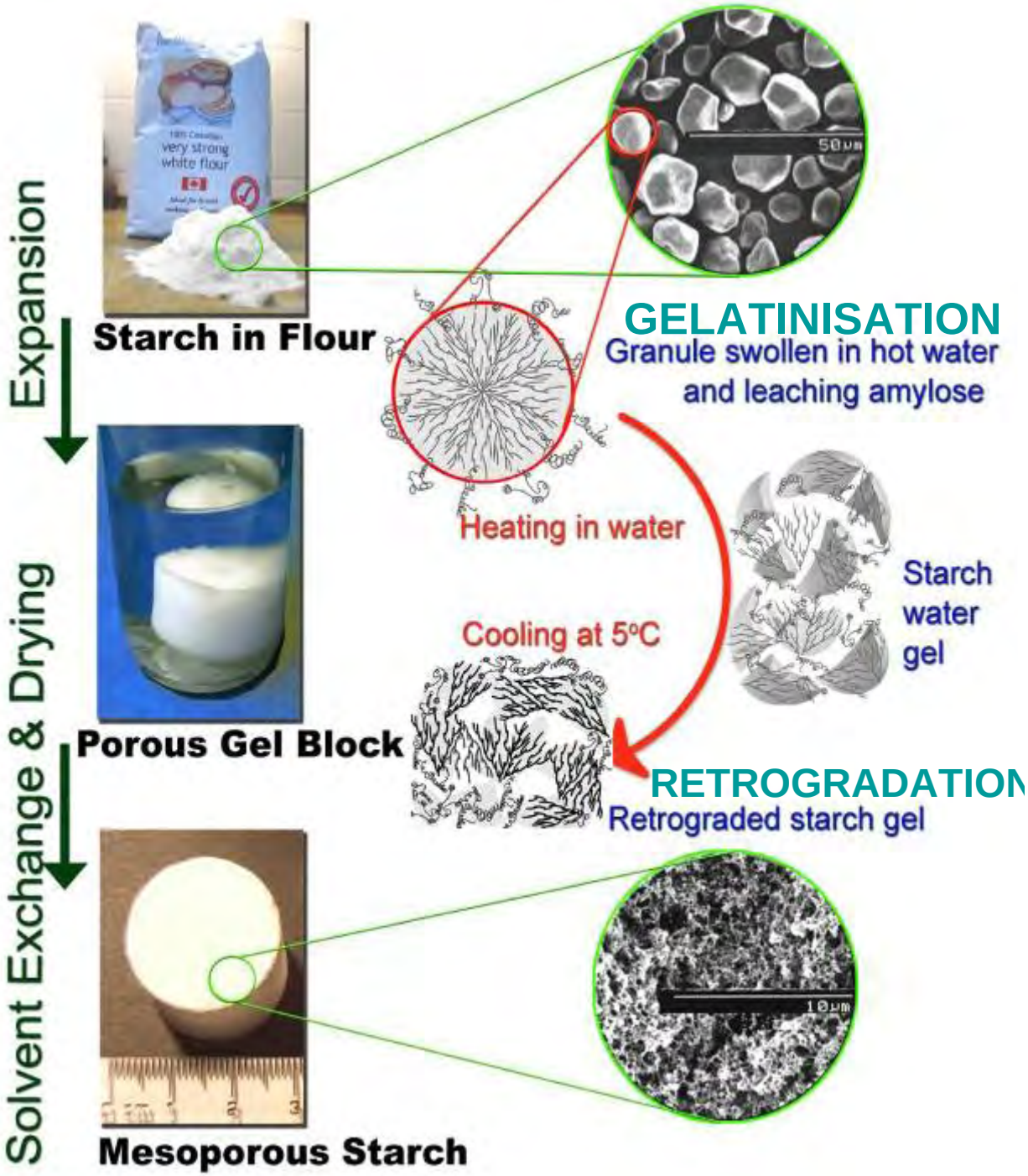
- Renewable material with assured supply
- Biodegradable
- Inexpensive
- It’s white!
- Organised structured polymer

DISADVATAGES

- **Properties affected by water**
- **Biodegradable**
- **Mechanically unstable with time**
- **Difficult to process/ modify**

EXPANDED STARCH

- Slow release media for drugs
- Encapsulation media for metals etc.
- Cooking
- Chromatography
- Plastics/ Adhesives



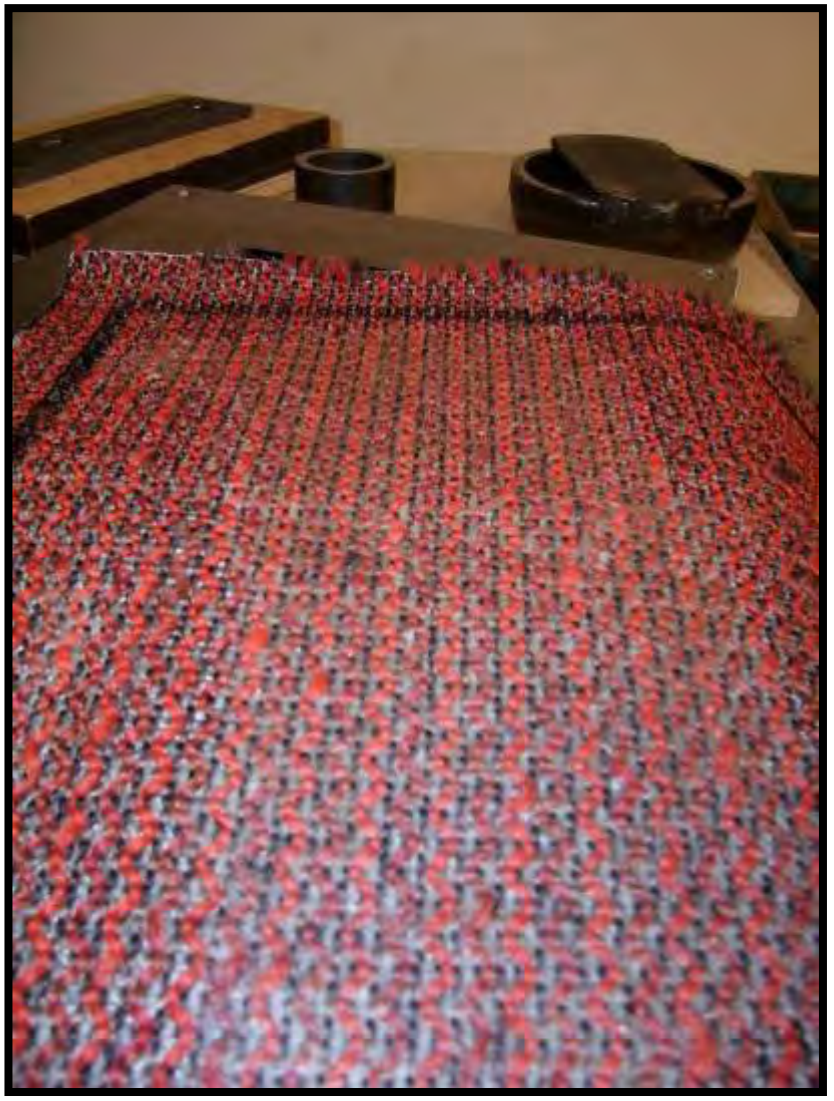
Starch modification

Modified expanded starch adhesive powder

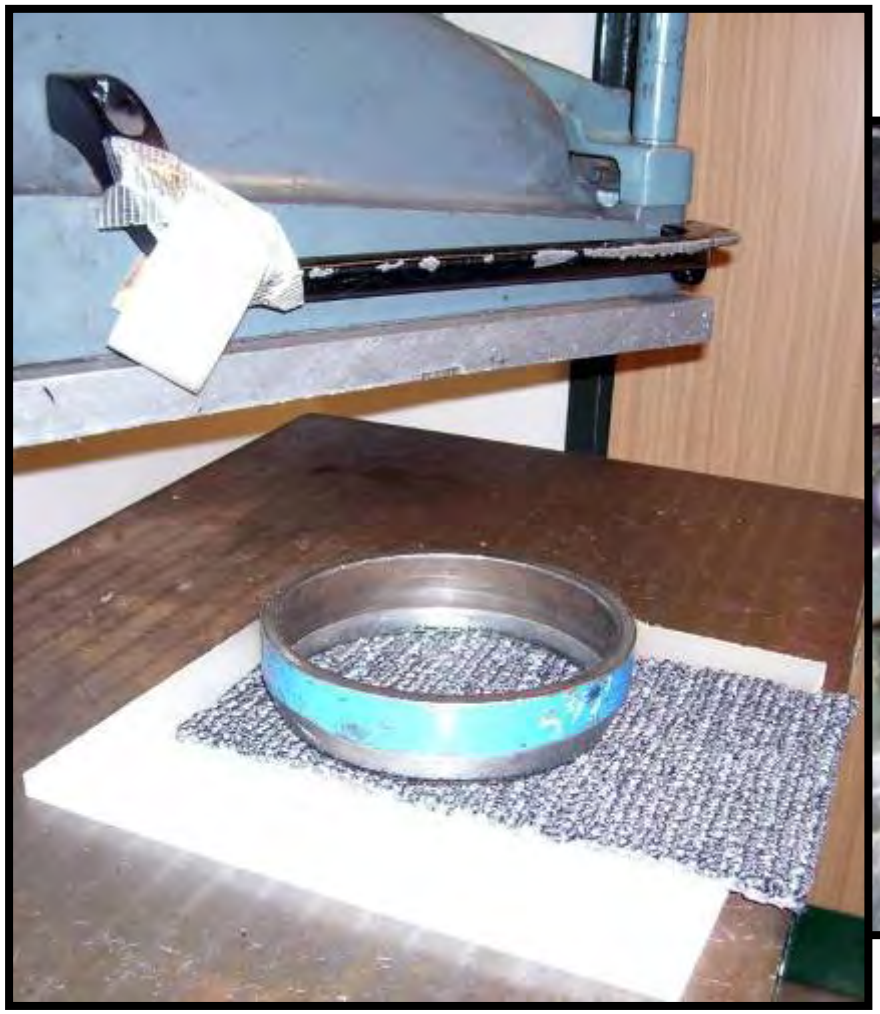
Homogenising the adhesive mixture

Fully homogenised sample

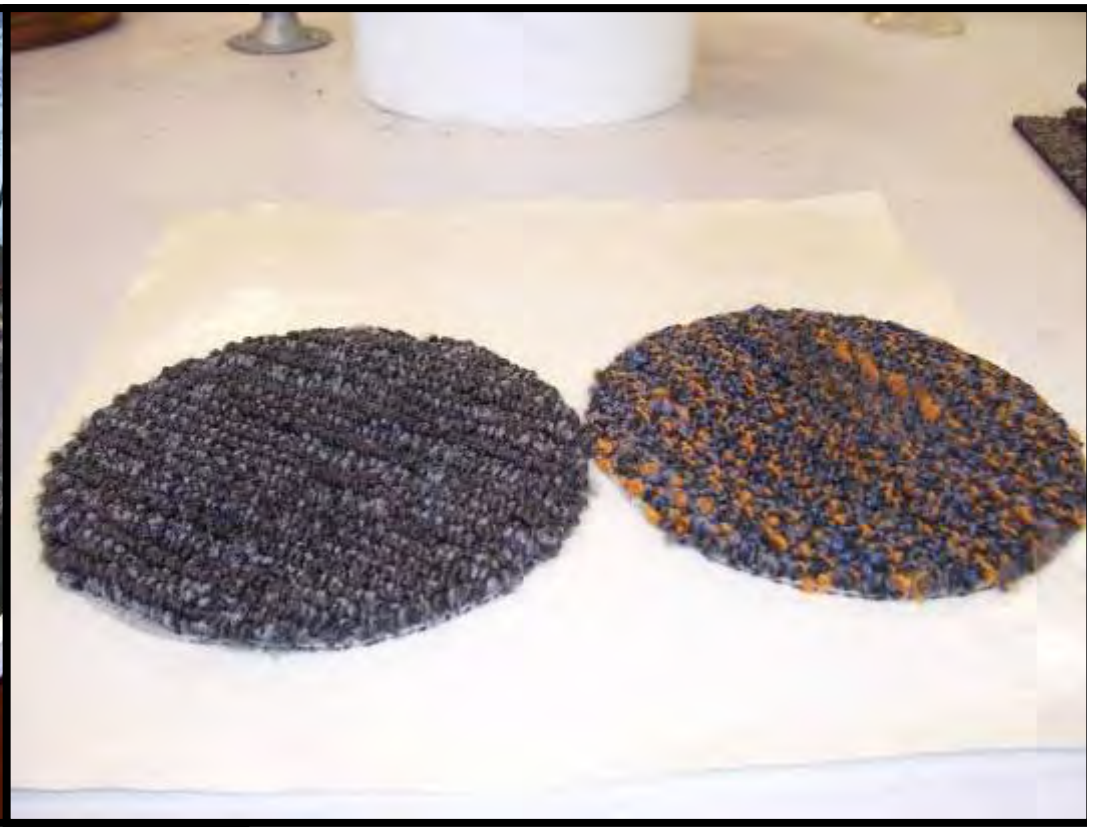
Homogenised paste applied to top layer of the carpet tile



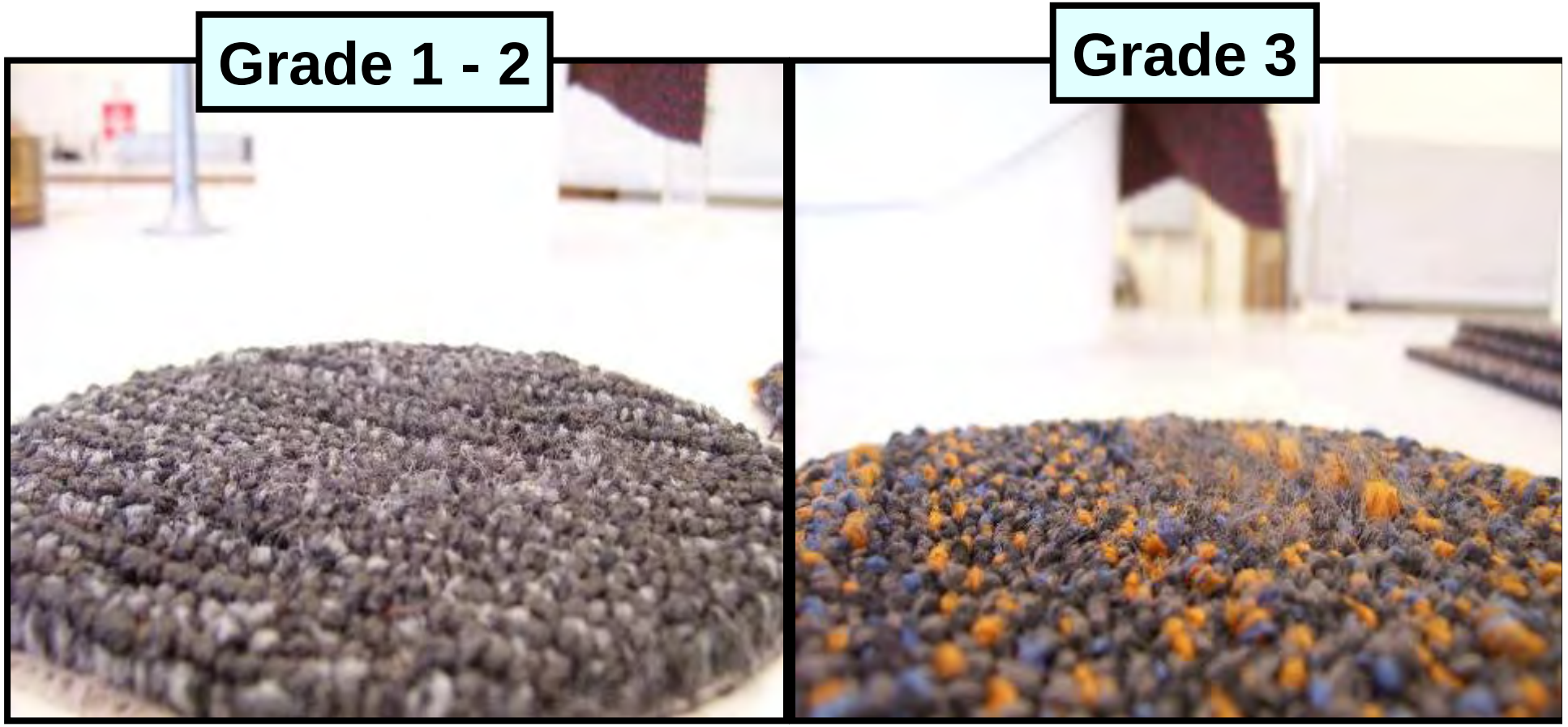
Adhered top layer cut and fixed to Martindale abrasion tester



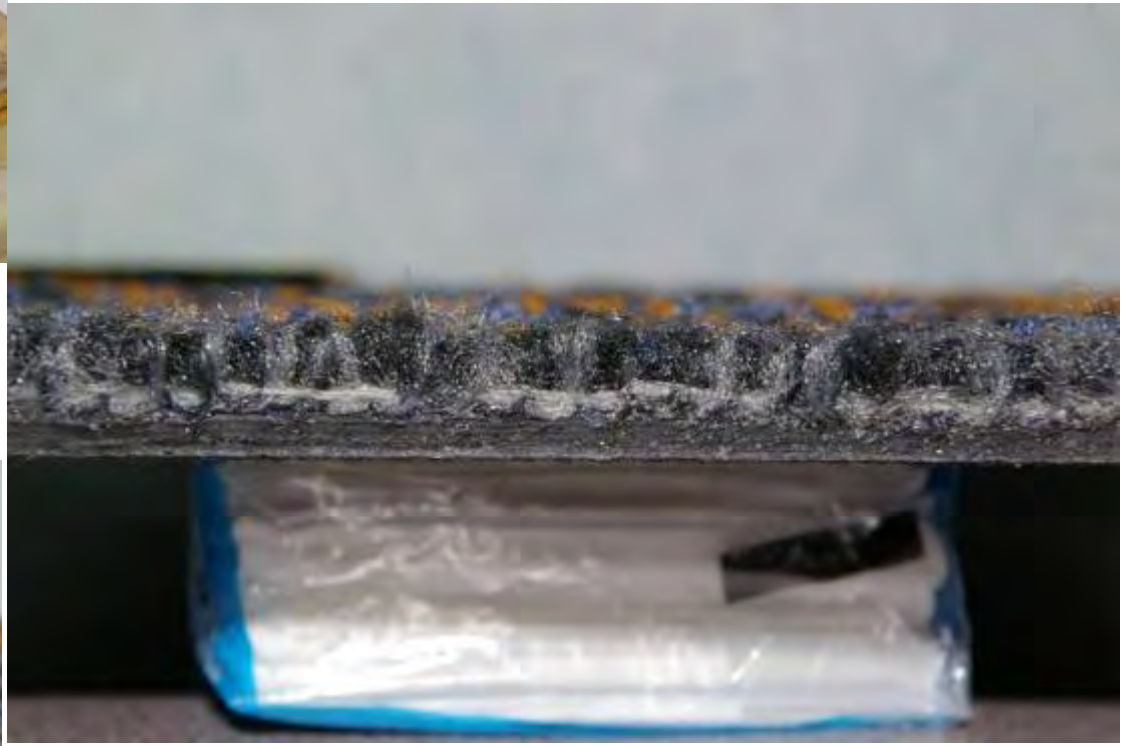
Standard test of 500 cycles with 8Lb weights



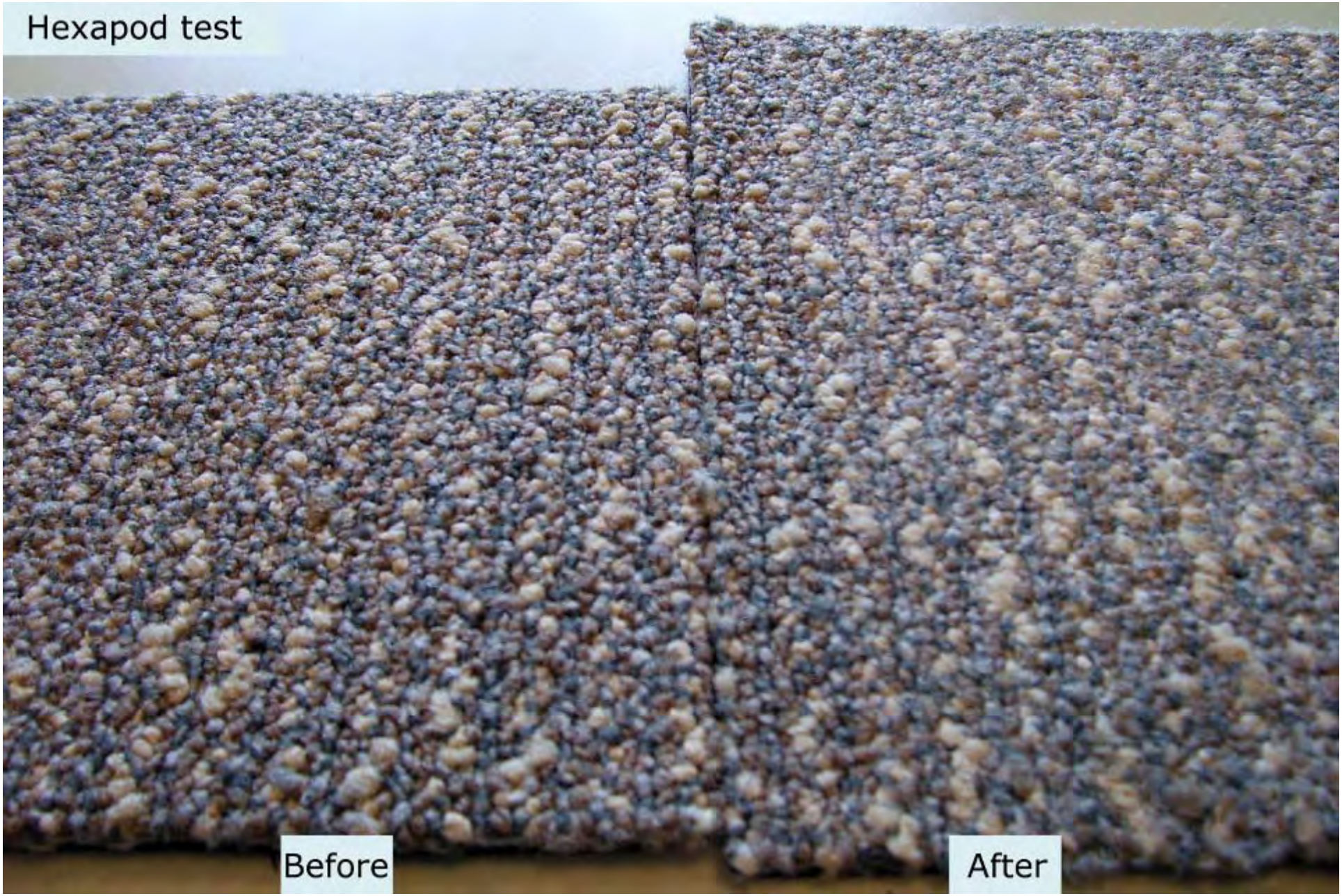
Some pilling present in right sample



Bitumen backing



Hexapod test



Accredited tests

Test	Grade (Pass ✓ fail ×)	Comment
Loop withdrawal	✓	Similar to commercial adhesives – suitable for commercial use
Martindale	✓	
Castor chair	✓	
Dimensional stability	✓	
Flammability	✓	Excellent – no need for added flame retardants
Switchability	✓	Strength reduced – no adhesive contamination

Summary

- Switchable renewable adhesive successfully produced from starch.
- Adhesive suitable for binding carpet tiles
  - Results similar or better than current adhesives
- Good working relationship with collaborating industries.

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- Contract Chemicals Ltd.
- NNFCC

- Technology Strategy Board

Thanks for you attention

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