Novel Absorbent Materials Obtained From Plant Proteins

Antonio Capezza,[a, b*] William Newson,[a] Richard Olsson,[b] Mikael Hedenqvist,[b] Eva Johansson [a]

[a]SLU Swedish University of Agricultural Sciences, Department of Plant Breeding, , Box 101, SE-230 53 Alnarp, Sweden
[b]KTH Royal Institute of Technology, Fiber and Polymer Technology, School of Chemical Science, Biotechnology and Health, SE-100 44 Stockholm, Sweden.
*ajcv@kth.se, antonio.capezza@slu.se

Superabsorbent polymers (SAPs) are fossil-based fluid-absorbent materials, heavily implemented in many daily-care applications such as diapers and sanitary pads. These applications account for more than 2-3% of the today's household waste. Furthermore, it has been acknowledged that the population grow and climate change will exponentially increase the demand for such SAPs, which will expand to other areas such as the agricultural industry.[1] As a consequence, the market for SAPs is expected to reach ca. 12 million dollars by 2023. Due to their petroleum source and low biodegradability, SAPs materials lack sustainability and thus emerging bio based technologies are needed. Proteins, being natural polymers having high liquid uptake capacity may provide a sustainable alternative to already existing SAPs.[2] Wheat gluten (WG), obtained as a product-stream of the starch industry, have shown the potential to perform as water-absorbent materials, absorbing ca. 30 grams of water per gram of dry material (g/g). These WG materials have also shown high non-polar liquid uptake and a previously unreported sponge effect.[3,4] To decrease the undesired sponge effect, chemical functionalization of the proteins has been herein carried-out. The functionalization process resulted in proteins having both high liquid retention and a course particle-shape, making these bio-based materials more competitive against synthetic SAPs. The water swelling of the protein-based materials developed in this work was enhanced 5 times in water, compared to untreated proteins. The results indicate that the modification of these inexpensive and readily available product-streams proteins can be considered as an alternative to fossil-based absorbing materials in the future.

References:

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