

Functional materials from cellulose: tissue scaffolds, formulation ingredients and printed materials

Janet L. Scott, University of Bath

Cellulose is the most abundant biopolymer and is eminently renewable with estimates of 10^{11} - 10^{12} tonnes renewed annually. Much effort is expended in converting some of this resource into fuels and chemicals, but there are significant opportunities to use the exquisite structure of cellulose rather than relying on molecular level de/reconstruction - after all, this is a homopolymer of glucose that is not soluble in water and supports large plant structures, largely through concerted hydrogen bonding! Cellulose may be processed into materials from soft hydrogels to very robust composites and relatively simple (and scaleable) chemistry employed to yield low degrees of surface modification that nonetheless modulate materials properties significantly. Combining processing and surface chemistry modification enables preparation of a range of materials including:

- delicate cellulose hydrogel based scaffolds for tissue engineering;
- particulate rheology modifiers and emulsion stabilisers that are effective at low weight percent inclusion in aqueous (and other) formulations; and
- robust, flame retardant composites in a range of formats from beads to sheets.

Selected examples of applications ranging from formulated consumer products to printable electronics will be presented.