Deep Eutectic Solvents
DES are brand new

Freezing temperature of Choline Chloride and Urea mixtures as a function of Composition (°C)

1st scientific study on DES less than 10 years ago

Rapid growth of research activities on their potential

Half of the scientific publications were made in 2012
Mimicking Nature

DES are used by plants to operate even during drought or frost periods.

Composed of natural products
- Amides
- Sugars
- Alcohols
- (amino) acids

Chemical characteristics
- Bio degradable
- Miscible with H2O
- Non toxic

Physical characteristics
- Low vapour pressure
- Low flammability
- Non volatile

DES are a sustainable and cheap alternative to far more cumbersome solvents used today.
Dissolving lignin

- Pure cellulose, lignin and hemicellulose
- Low cost
- From different sources (wood, straw)
  → Tailor made fibres depending on DES mixtures

Dissolving cellulose

- Recovery of pure cellulose from papermaking residues
- Low cost
  → Clean dissolved pulp or building block for biochemicals, materials or fuels

Dissolving ink and other contaminants
4 key applications

- Omnivore pulping
- Recycled fibre processing
- Recovery of cellulose from waste
- Papermaking and sheet forming
Savings

- DES replaces traditional pulping processes.
- DES produces high quality cellulose, hemicellulose and sulphur-free / unchanged lignin.

Energy reduction

40%

CO₂ reduction

20%

The true savings lie outside the mill boundaries:
If lignin replaces aromatics in the chemical industry

→ up to – 90% overall energy and CO₂ savings
Value creation

The omnivorous pulp mill by DES delivers
• Any fibre
• At any place
• From any source
• With a very low energy and environmental impact

Further added value:
• Biomass logistics $\rightarrow -1$ to $-2$ Mt CO$_2$ emissions related to transport
• Lower investment costs $\rightarrow$ up to $-50\%$