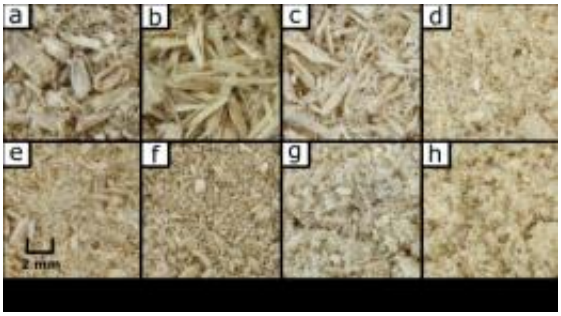
# Scientists save energy by lubricating wood

March 9 2012, By Simon Levey




Photograph shows ground wood chips after treatment at 90 °C for 1 h with various ionic solvents and other liquids: (a) no liquid, (b) Organosolv, (c) DMSO, (d) silicone oil, (e) [C4C1im][HSO4], (f ) [C4C1im][MeCO2], (g) [C4C1im][NTf2], (h) Fomblin.

(PhysOrg.com) -- A little bit of lubrication could make a big energy saving when manufacturing sustainable biofuels and bio-chemicals from timber, according to research published in the journal Green Chemistry this month.

Scientists at Imperial College London have demonstrated that a key part of biomass processing could be made 80 per cent more energy-efficient by taking advantage of the slippery properties of fluids called ionic solvents. They say this could reduce the cost of biofuels by 3p per litre, around 10% of its current cost.

The efficiency savings can be made during one of the energy-intensive stages of the biomass manufacturing process, when solid timber chunks

are turned into a 'soup' of fluids and fine wood particles in an industrial grinder, which works in a similar way to a giant coffee grinder. The discovery paves the way to making the biomass industry greener.

Treating timber with ionic solvents has previously been shown to help processing wood into biofuels and chemicals. While initially this effect was only attributed to the solvents' ability to partially weaken wood's tough, fibrous structure, this new study suggests the energy-savings are predominantly due to the way that these fluids lubricate the wood chips as they go around in the grinder.

Lead author of the study Dr. Agnieszka Brandt, from the Department of Chemistry at Imperial College London, said: "Tree wood is a mine of really valuable chemicals locked up in a safe that we need to unlock before we can use the different components. Breaking down the timber into a fine powder helps us to access these chemicals, but it needs to be an energy-efficient process to make it sustainable. Our previous work showed how the chemical action of ionic solvents improved energy efficiency in the processing, but we were surprised to discover how much more energy could be saved when take advantage of their lubricating physical properties."

'Green' biomass products are often hailed as environmentally friendly alternatives to fossil fuel and its derivatives. Trees such as fast growing species of willow and pine will be an important source of biofuels and basis for manufacturing naturally occurring chemicals like vanillin (a flavoring in the food industry), valuable oils and biomass-derived plastics, such as polystyrenes or polyesters (used for plastic bottles). Scientists are working to ensure biomass lives up to these expectations, assessing and reducing the environmental impact of every part of the product cycle, including the source of its raw materials, how and where they are transported, and what happens to the by-products of the industry.

Research author Tom Welton, Professor of Sustainable Chemistry and Head of Imperial's Department of Chemistry, said: "Sustainable development has been defined by the UN as development to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

"The alleviation of poverty and improvement of all of our living standards cannot continue without us also ensuring that our planet is in a condition to support these. As our petrochemical resources run out and we need to turn to other places for our energy and materials needs, we have an opportunity to build these new industries in a sustainable way. This is an opportunity that we can't afford to miss."

Provided by Imperial College London