EuroSciCon

9th Edition of International Conference on

Biofuels and Bioenergy

March 29-30, 2018
Edinburgh, Scotland

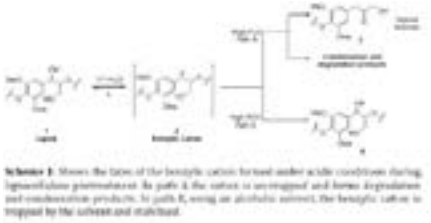
Nicholas James Westwood, Arch Chem Res 2018, Volume 2
DOI: 10.21767/2572-4657-C1-001

PROCESSING BIOMASS USING BUTANOL: CIRCULAR ECONOMY ARGUMENTS

Nicholas James Westwood

University of St Andrews and EaStCHEM, UK

Industry processes lignocellulosic biomass into its constituent cellulose, hemicellulose and lignin fractions using harsh conditions to liberate the sugar fractions with high purity. This often results in considerable degradation of the lignin fraction, as the native chemically-labile β-O-4 linkages (1) (see Scheme 1) are almost completely degraded. This degradation often occurs through a chemically reactive benzylic cation (2) leading to Hibbert ketone structures (3) or condensation and degradation products (via path A in Scheme 1).1 Whilst lignin degradation during a pretreatment is less important if the lignin is to be burned as a cheap energy source, many researchers view that the economics associated with a biorefinery will be much stronger if the lignin has one, or preferably several, higher values applications.The use of alcoholic solvents, in particular butanol, for the pretreatment of lignin is designed to trap benzylic cation 2 through alcohol incorporation (to give 4). The resulting butanosolv lignin has higher β-O-4 content than lignin extracted without alcoholic solvents.2 This maintenance of the β-O-4 content means that the lignin is more applicable to depolymerisation reactions to give pure aromatic monomers of potential relevance to the Chemical Industry.3,4 It also means that the controlled synthesis of novel biopolymers is achievable using the β-O-4 unit as the point of modification.5 This talk will discuss the advantages of the butanosolv process and will show that in addition to a useable lignin fraction, the cellulose and hemicellulose streams are also suitable for subsequent processing. We will present examples of our ongoing efforts to process the product streams retained after lignocellulose extraction by this process.5 In particular, the usefulness of α-protected butanosolv lignin and chemical modification strategies targeting the available γ-position will be detailed.5 Applications of this process to a range of different biomasses will be discussed.



Biography

Nick Westwood's research group is highly collaborative. It uses high level methods in organic synthesis to enable novel insights to be developed in sustainable chemistry and chemical biology. After studying chemistry at Oxford University, Nick completed his PhD with Chris Schofield FRS at Oxford and then carried out post-doctoral research at the University of Texas at Austin (with Philip Magnus FRS) and Harvard (with Tim Mitchison FRS and Matthew Shair). He returned to the UK in 2001 as a Royal Society University Research Fellow at the University of St Andrews and has worked there since then. In 2011 he began a research project on the characterisation and depolymerisation of the biopolymer lignin. This work has expanded to include more general approaches to processing biomass although the main goal remains to identify better ways to use the lignin component rather than burning it.

njw3@st-andrews.ac.uk