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Editorial

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Editorial

Stuart Coles BSc (Hons), PhD
Reader, Sustainable Materials and Manufacturing, Warwick University,
Coventry, UK



Welcome to volume 11, issue 2 of *Green Materials*. I'm especially privileged to be able to bring you this editorial with a great collection of papers from excellent authors.

Polymers and composites are at the forefront of the field of 'green materials'. Both polymers and composites are ubiquitous within modern society but are being constantly challenged due to the negative connotations associated with their disposal. However, we should not forget the great benefits that these materials bring to modern society, and as such it falls upon researchers to develop greener materials while being cognisant of future consequences of a material's use. By chance, that's exactly what this issue brings forward.

Firstly, Fan *et al.*¹ show some promising results with starch-based straws. Straws have often felt the brunt of legislative powers, with many countries now banning placing single-use plastic straws. The work contained in this paper shows how combining chitosan with starch develops a mixture that can be extruded under industrial conditions and produce a polymer straw that has improved mechanical properties and resistance to water adsorption – a key issue with current plastic replacements found on the market today.

Reducing consumption of fossil-based resources is a theme that runs through the rest of the papers. Yildirim *et al.*² have shown that lignosulfonates, a by-product of the pulp and paper industry, can be successfully blended into urea–formaldehyde adhesives, giving engineered wood composites improved mechanical properties while reducing formaldehyde emissions. Given that this class of adhesives can commonly be found in domestic furniture applications, stronger materials that present lower hazards to those around them can only be a positive step forward!

Avoidance of fossil-based resources in composite materials remains the focus with the work of Lascano *et al.*,³ aiming to produce bio-based composites with jute reinforcements and a polylactide matrix. These readily manufacturable, compression-moulded composites offer comparable properties to similar composites made from petroleum-based resins, and can be applied to several different sectors. The process also develops composites with a high fibre content, which helps to reduce the cost by removing some of the more expensive polymer without sacrificing the properties.

It is often not just the polymer or the composite itself that needs investigating, as many products on the market contain additives or processing agents that can be equally as hard, if not harder, to substitute than the original fossil-based materials. Zulkifli *et al.*⁴ tackle this challenge by looking at poly(vinylidene fluoride) (PVDF) and some of the agents required to plasticise this material for processing. The use of epoxidised oleic acid at a 10% level gave a processed polymer with the appropriate balance of thermal and mechanical properties. PVDF remains an important polymer in many applications, but often is required to be more flexible while retaining thermal stability and low conductivity – and plasticisers are essential for this to be able to happen.

Finally, Kadirgama *et al.*⁵ have developed a new formulation of engine oil with a cellulose nanocrystal (CNC)-based additive. Utilising natural materials to enhance the properties of the engine oil helps extend the life of the materials used within the engine, getting two benefits for the price of one! With this study, the addition of CNC alongside graphene nanoplatelets produced a lubricant with a homogeneous dispersion of additives capable of reducing friction and wear of worn surfaces.

With the current pressures on resource consumption and end-of-life disposal on all materials, there is no step forward that is too large or too small. Any improvement on what is the current state of the art needs to be welcomed and built upon in the future. All of these studies produce just this – a step forward in our understanding of green materials that can either be implemented now or utilised as a stepping stone in the continual pursuit of the next improvement!

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