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Títol del projecte

Copolymerisation and copolymers of cyanoacrylate and captodative monomers

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BREU DESCRIPCIÓ DEL PROJECTE DE RECERCA

Copolymerisation and copolymers of cyanoacrylate and captodative monomers

Cyanoacrylates (CAs) are the monomers used in instant adhesives, for example superglues. They are unique in that they undergo instantaneous polymerisation at room temperature without the apparent need of an external stimulus - in fact the surface to which they are applied acts as the 'stimulus' by way of its nucleophilic contaminants or surface reactive groups such as absorbed moisture, or, inherently (chemically) basic nature. CAs polymerise to give linear homopolymers. The monomers are typically formulated with thickeners and viscosity modifiers to produce products that are convenient in end-use. However, linear polymers can only achieve certain limited properties and only certain formulation components are compatible with the highly reactive CAs. As a result, CA adhesives have limited application scope - their thermal and humidity resistance is limited and only a handful of formulation components are known to modify product rheology. Further, the latter ingredients are known to all and are 'off-patent' since decades, so product differentiation has become difficult. Still further - the most common CA monomer - ethyl cyanoacrylate (ECA) is becoming a commodity and fewer groups are undertaking the research needed to improve properties and distinguish commercial offerings based on this.

The limitations of CAs and their polymers can be overcome by modifying polymer structure to prevent polymer chain degradation at temperature (thermal depolymerisation) or by hydrolysis. Structural modification is possible through co-polymerisation with more robust monomers.



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That approach has been proven with acrylic copolymerisation, however no control of polymer architecture has been achieved due to the random nature of such copolymerisations, also, such copolymers can only be made ex-situ by radical techniques after first suppressing the natural and useful anionic/ nucleophilic polymerisation of the CAs. Thus adhesives cannot be made that cure as copolymers of CAs and normal acrylates. Captodative (CD) monomers, for example CD acrylates or nitriles are of a very closely related structure to CAs and although these also require radical polymerisation - no study has been conducted to investigate the possibility of modifying the susceptibility of such monomers to more nucleophilic species. Part of this study will address this topic with an aim to see if indirect copolymerisation is possible. A second part of the study will be directed to the preparation of copolymers of high utility. Homo- or copolymers of CD monomers with CAs has already been conducted in some pre-project work and interesting materials result with already improved thermal and base tolerant properties. These have immediate application in adhesives as formulation components,

In sum, the research will yield routes to access a range of materials with significant properties that could be delivered in-situ with convenience of instantly polymerisable systems such as superglues at best, and at least highly differentiated instant adhesives. The probability of useful intellectual property generation is also high.