

Impact Statement

This study examines the degradation properties of nitrocellulose (NC), shedding light on the mechanistic details of decomposition that are yet currently either unknown, or are unclear in existing literature. NC is used in an extensive variety of products, with utilisation in household, industrial, military and medicinal applications. Improved understanding of the fundamental chemistry in the degradation of NC could benefit the following key impact areas:

Knowledge & collective benefit

- Broaden understanding and depth of knowledge in the area of NC degradation, with the view to validate or deconflict competing schemes in literature.
- Improve conservation practices for existing and legacy NC products of cultural value, such as cinematographic film, artworks and historical munitions with better information on environmental conditions most impacting the decomposition pathways.

Environmental

- Inform improved NC disposal methods, avoiding existing harsh chemical and incineration treatments, with opportunity to feed back into other manufacture streams such as the production of fertiliser.
- Facilitate the design of next generation NC products with lower environmental impact, in terms of durability and recycle-ability, with cleaner industrial processes.

Safety

- Refine guidelines on safety and usage, based on detailed knowledge of the degradation mechanisms, improving upon current practices based on aggregate experimental observations.

Industrial & commercial

- Improve versatility and adaptability in NC production and its product formulations, in view of varying cellulose feedstock sources due to supply chain fluctuation.
- Streamline industrial processes to specific reactivity requirements, based on detailed mechanistic considerations regarding shelf life and interaction with other components, leading to cost saving and better performance of final product.

Innovation

- Allow the design of new NC products, not limited by crude understanding about the material shelf life and reactivity, leading to novel applications.