

Cluster-triggered photoluminescence for online materials analysis

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The transition from the linear, hydrocarbon-based economy to the circular, bio-based economy requires not only the development of innovative materials of increasing complexity but also the technologies to both process and analyse them at an industrial scale. We have many techniques available to us within academia to accurately characterise new materials. However, they often require access to expensive equipment and highly qualified personnel, and typically involve lengthy acquisition times and/or sample preparation. As such, they are not suitable for online analysis within the industrial setting.

My research aims to address this by taking advantage of a recently discovered photoluminescence phenomenon known as cluster-triggered emission (CTE). CTE occurs in non-conjugated compounds, particularly polymers, when they aggregate, or cluster, together. The mechanism behind this involves heteroatoms with free electron pairs that participate in inter- and intra-molecular interactions, e.g., hydrogen bonding. As such, spectroscopy based on the technique may be used to directly characterize the molecular interactions that form the supramolecular structure of materials with suitable chemical groups.

In this seminar, I will present my research into developing CTE into an analytical technique. This will range from the determination of key physicochemical properties of nanoparticles to the identification of common microplastics. The advantages and disadvantages of CTE relative to conventional methodologies will be discussed along with the challenges that need to be overcome to fully realise the potential of the technique. Finally, a broad vision regarding prospective future analytical applications will be presented.

Zoom: <https://syddanskuni.zoom.us/j/68986486305>