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<th>Spray-drying processing and characterization of sodium nitrite-aluminium</th>
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<td><strong>Author(s)</strong></td>
<td>Lee, Priscilla Li Yi</td>
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<td>Lee, P. L. Y. (2011, March). Spray-drying processing and characterization of sodium nitrite-aluminium. Presented at Discover URECA @ NTU poster exhibition and competition, Nanyang Technological University, Singapore.</td>
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Introduction
Spray drying is adopted for the processing of sodium-nitrite-aluminium to investigate how the process of spray drying forms a structure of fuel and oxidizer via the establishment of microencapsulation. This was proposed to improve the interfacial contact between them for good combustion kinetics and thermal properties. Sodium nitrite serves as an oxidizer by releasing oxygen upon thermal decomposition. Aluminium will act as a fuel, which has been extensively used due to its high enthalpy of heat of 31kJ/g. Two sizes of Aluminium were used to explore how they affect the particle formation and thereby the thermal and kinetic properties.

Experimental (Spray drying process)

Discussion and Results
Studies include structural, thermal and kinetic characteristics of the spray dried products by SEM-EDX, DSC-TGA and parr dynamic measurement (which measures the rate of change in pressure - dP/dt ) respectively.

Major Achievements
Structural characteristics
• Achieved filled spherical clusters with high density (<10% difference to theoretical density)
• Achieved relatively homogenous particle size distribution of 100 to 400 µm
• Spray drying has allowed the control of particle size by controlling the process parameters, i.e. feed concentration

Thermal and Kinetic characteristics
• Compared to heating Al alone in air, heating spray dried Al/NaNO₂ in argon showed early exothermic temperature which is postulated to be due to the close interfacial contact of the oxidizer and fuel
• Better combustion kinetics are obtained with smaller-sized and spherical Al, and with higher amount of Al in the composition for combustion in air

Conclusion
Established a microstructure of spray dried spherical cluster (of oxidizer enveloping the fuel) with good combustion kinetics and thermal properties, for high packing density required for post-processing applications

References
1. David Lide, CRC Handbook of Chemistry and Physics, 88th Edition