

MXENE ENRICH CONCENTRATION SOLAR POWER (CSP) COOLANT

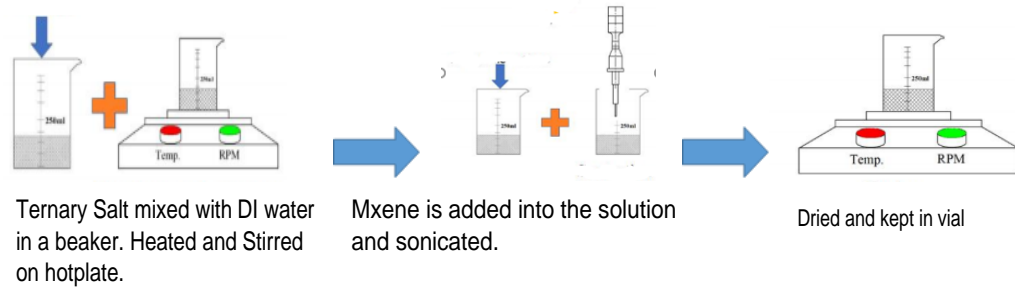
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Problem Statement

- The increasing effect of massive climate change due to **greenhouse gas emission**
- **Main cost in CSP plant is the heat transfer fluid and thermal energy storage system**
- **Currently, most of the molten salt HTF works below 600 °C, by increasing the boiling point will increase the efficiency of CSP system**
- **Good thermophysical properties – this is necessary to have efficient heat transfer during the HTF flows in the solar field block/heat exchanger**

State of the Art/ Methods



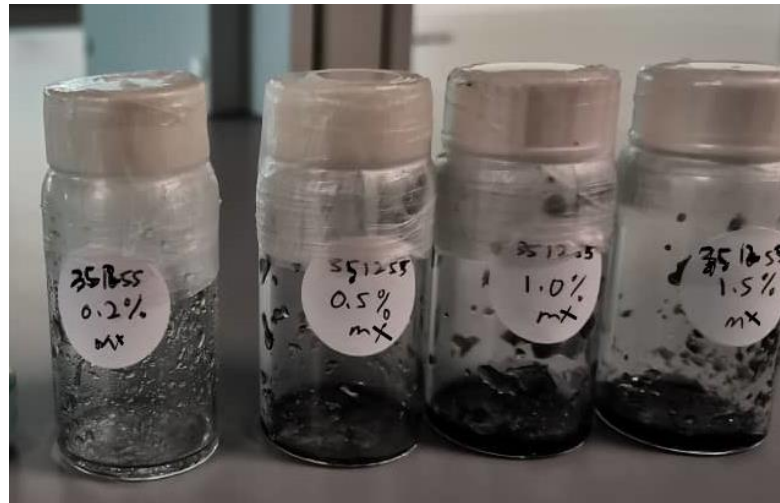
Novelty/ Originality/ Inventiveness

- CSP coolant is **biodegradable materials**
- **Impact to the environment since the material is safe for the environmental**
- **New materials for CSP coolant.**

Benefits/Usefulness/ Applicability

- CSP Industries **useful in term of the coolant production**
- **Biodegradable material**
- **Employment of the society can be increased since the wealth creation; SME**
- **Enhance skill workers for higher TVET**

Product Image and Product Characteristics/Results



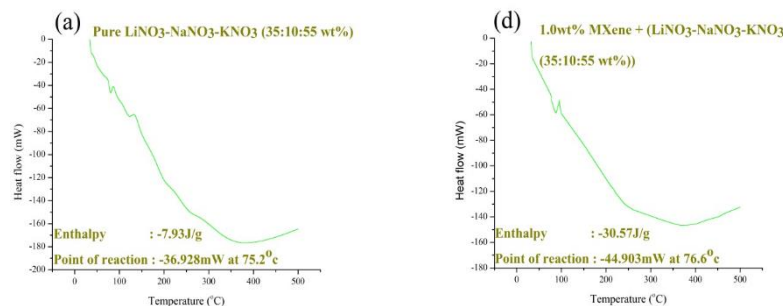
Social Impact

- **The employment can be increase with the development of new coolant production company.**
- **The increased of high skill workers especially in the nanotechnology**

Collaboration Partner

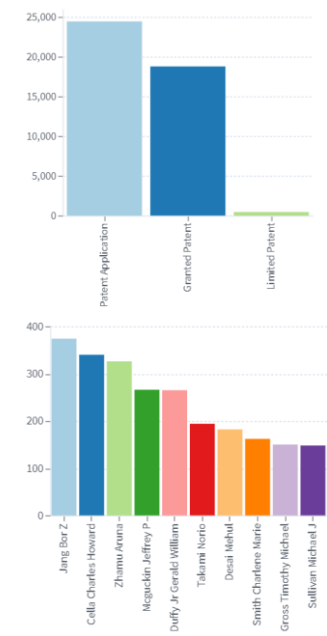
Alunan Puncak Sdn Bhd, LOI signed 22.6.2020

MARKETABILITY



- The **enthalpy value of 7.93 J/g** and **melting point of 75.2°C** is measured for a pure eutectic mixture of **LiNO₃-NaNO₃-KNO₃**.
- With the addition of **1.0 wt% of MXene** into the ternary salt, **the enthalpy and melting point is increased to 30.57 J/g and 76.6°C.**
- **Enthalpy increased 285.5%** and **melting point increase by 1.86%.**
- The increase in the enthalpy might be due to the strong interaction of MXene nanoparticles with the molten salt molecules and formed a huge specific surface area .

Patent



Environmental Impact

- **Sustainable index increased 35 percent**
- **Harmful index reduce 75 percent**

Publication

Thermal and energy performance improvement of hybrid PV/T system by using olein palm oil with MXene as a new class of heat transfer fluid." Solar Energy Materials and Solar Cells 218: 110754. (WOS-Q1)

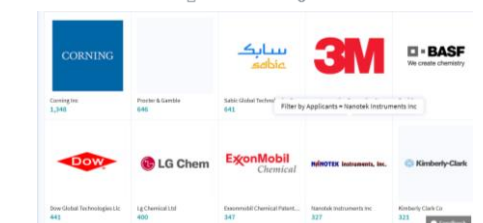
Optical and conductivity studies of polyvinyl alcohol-MXene (PVA-MXene) nanocomposite thin films for electronic applications." Optics & Laser Technology 136: 106772. (WOS-Q1)

Conclusion

- **1.0 wt% of MXene** into the ternary salt, **the enthalpy and melting point is increased to 30.57 J/g and 76.6°C.**

Cost Analysis

Existing product	RM	Enhancement (%)
500ml	RM 45.00	
CER coolant	RM 25.00	
500ml	RM 45.00	
1L	RM 45.00	
5L	RM 200.00	
Performance Enrich		27
Cost saving		44



The patent on the molten salt is **increasing year by year**, almost **10 to 15 percent**. The is **no patent on the Molten salt with MXene**. The chances to be patented is high since the number of patent increasing. Lot of company also patented and **mostly are patented in US and Canada**