

VANDEMOORTELE CENTRE 'LIPID SCIENCE AND TECHNOLOGY'

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POST-CRYSTALLIZATION OF SHEAR CRYSTALLIZED FAT BLENDS OF PALM FAT AND ANHYDROUS MILK FAT

Problem

❖ In industry, grains often appear in margarines made of the blends between palm fat and anhydrous milk fat (AMF) at 5°C after longterm storage (3-4 weeks).

❖ Grains are fat crystals with large size (40-200 µm)

❖ The grains formation can relate to **post-crystallization of fat blend in the storage**

➔ This study focused on **post-crystallization of shear crystallized fat blends** using classical techniques including pulsed field gradient nuclear magnetic resonance (pfg-NMR), differential scanning calorimetric (DSC) and polarized light microscopy (PLM)

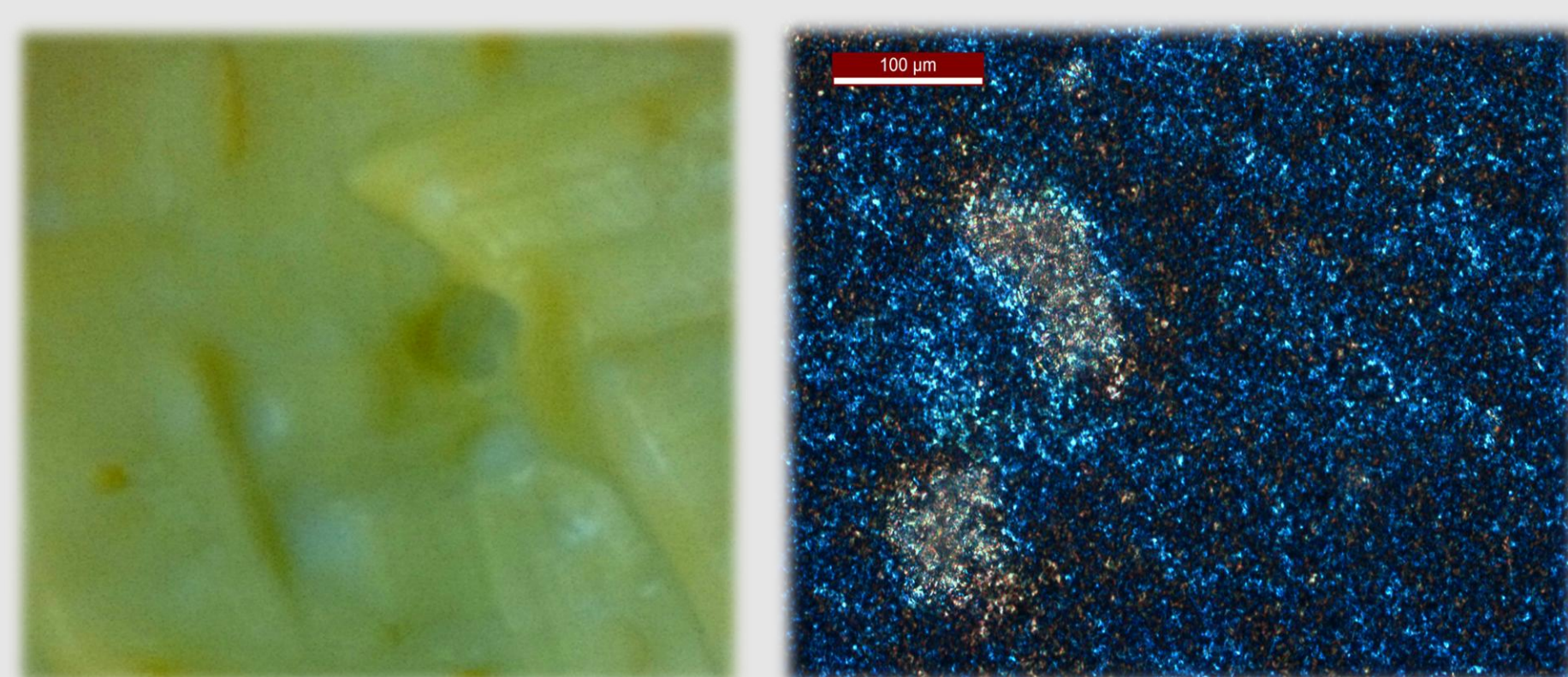
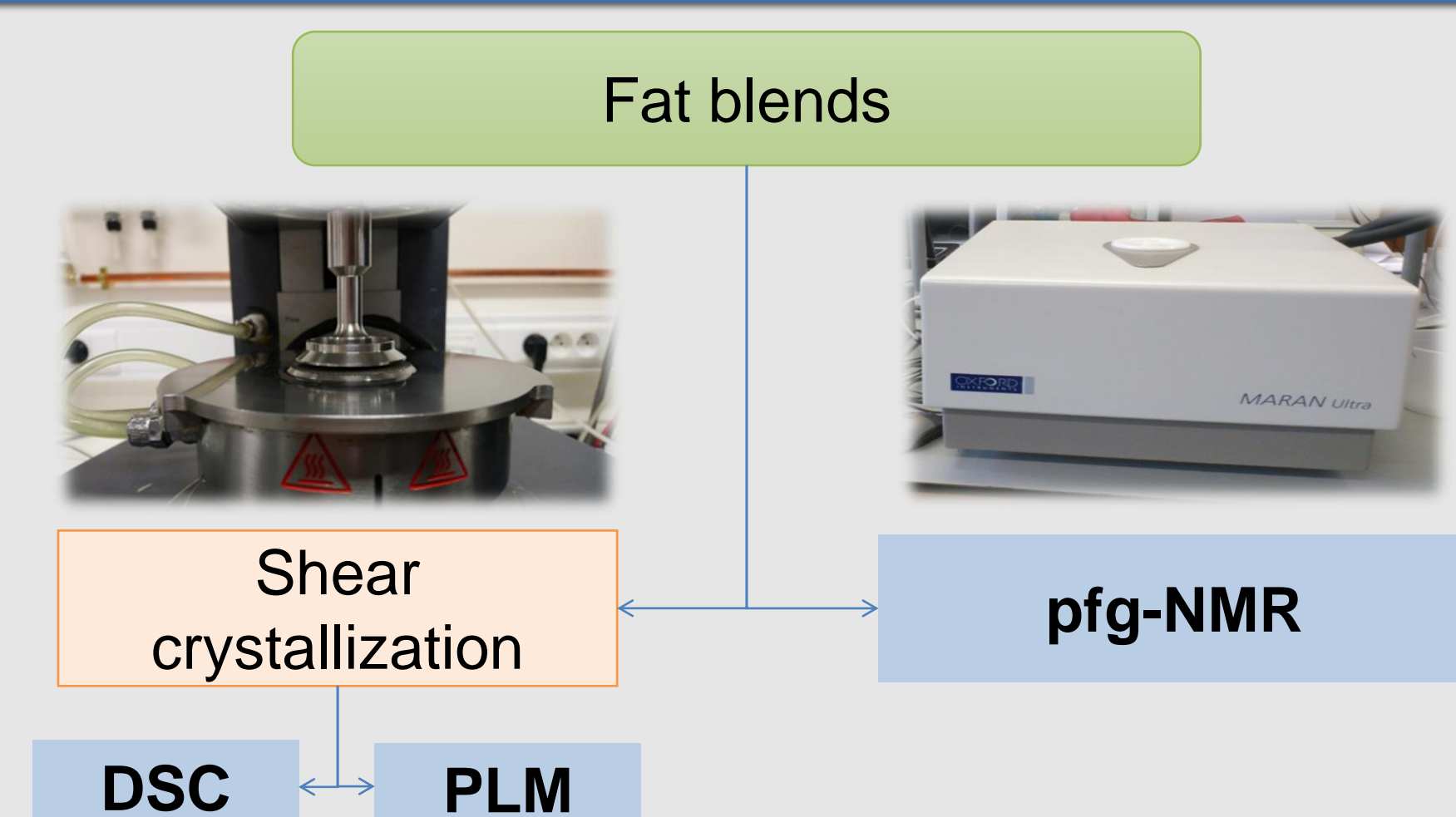


Fig 1. Grains in margarine products observed by naked eye and PLM

Methods



- Fat blends: Palm oil, Palm stearin, Rapeseed oil and Anhydrous milk fat (AMF)
- AMF concentration: 0, 25, 50%
- Storage conditions: 28 days (d) at 5°C and 15°C
- Pre-treatment: Tempering (T) at 25°C in 48h and non-tempering (NT)

Results

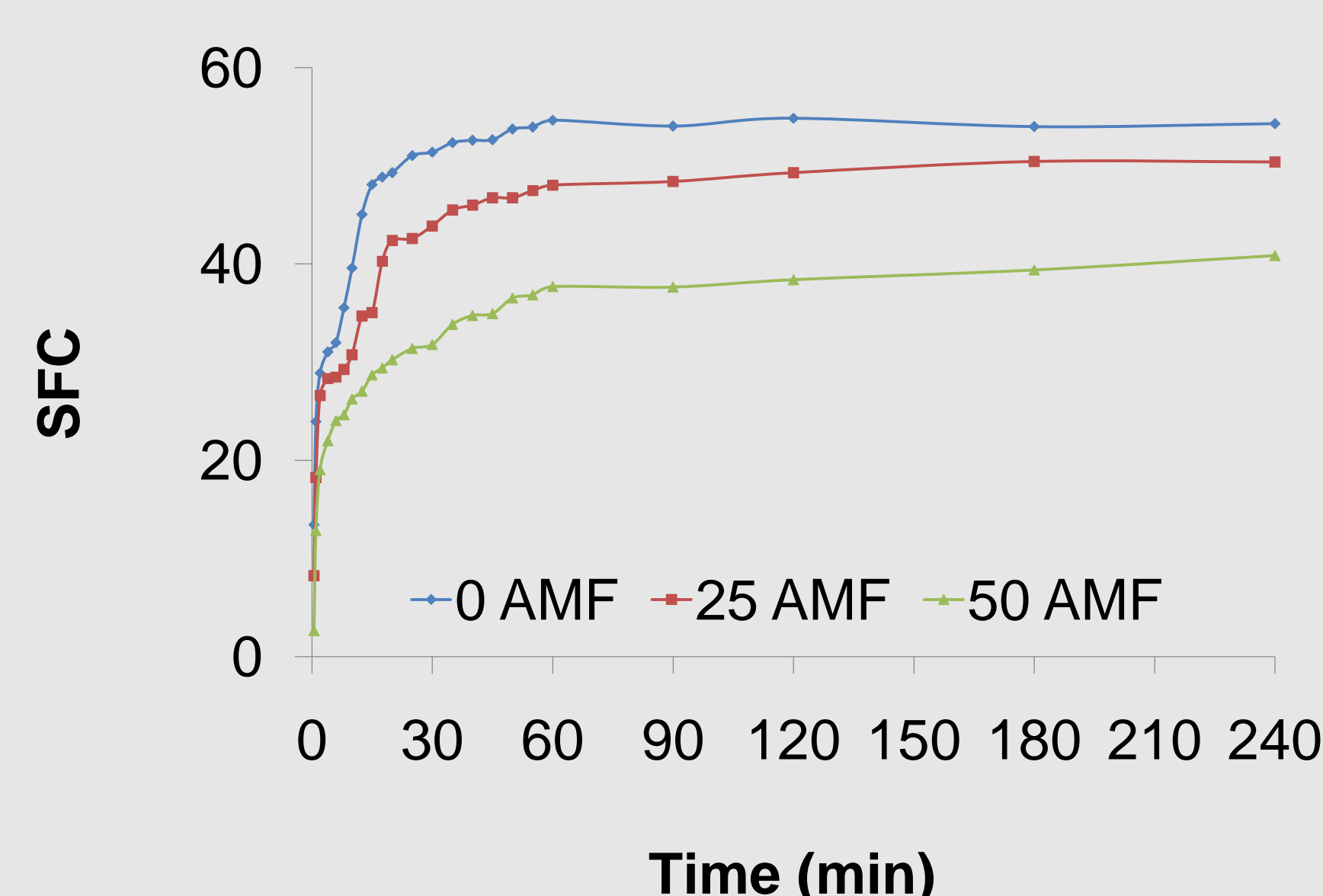


Fig 2. Crystallization kinetic of fat blends at 15°C

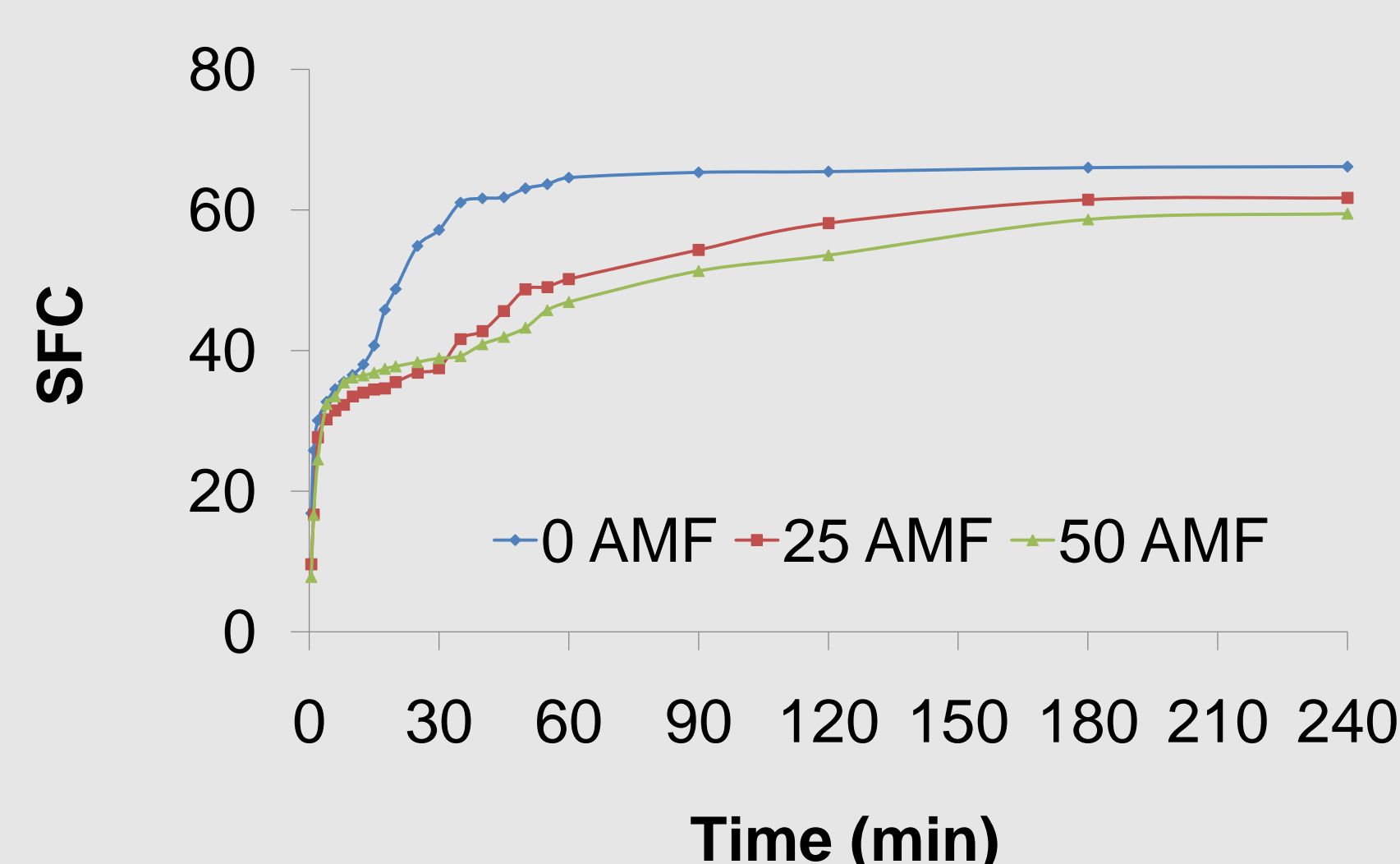


Fig 3. Crystallization kinetic of fat blends at 5°C

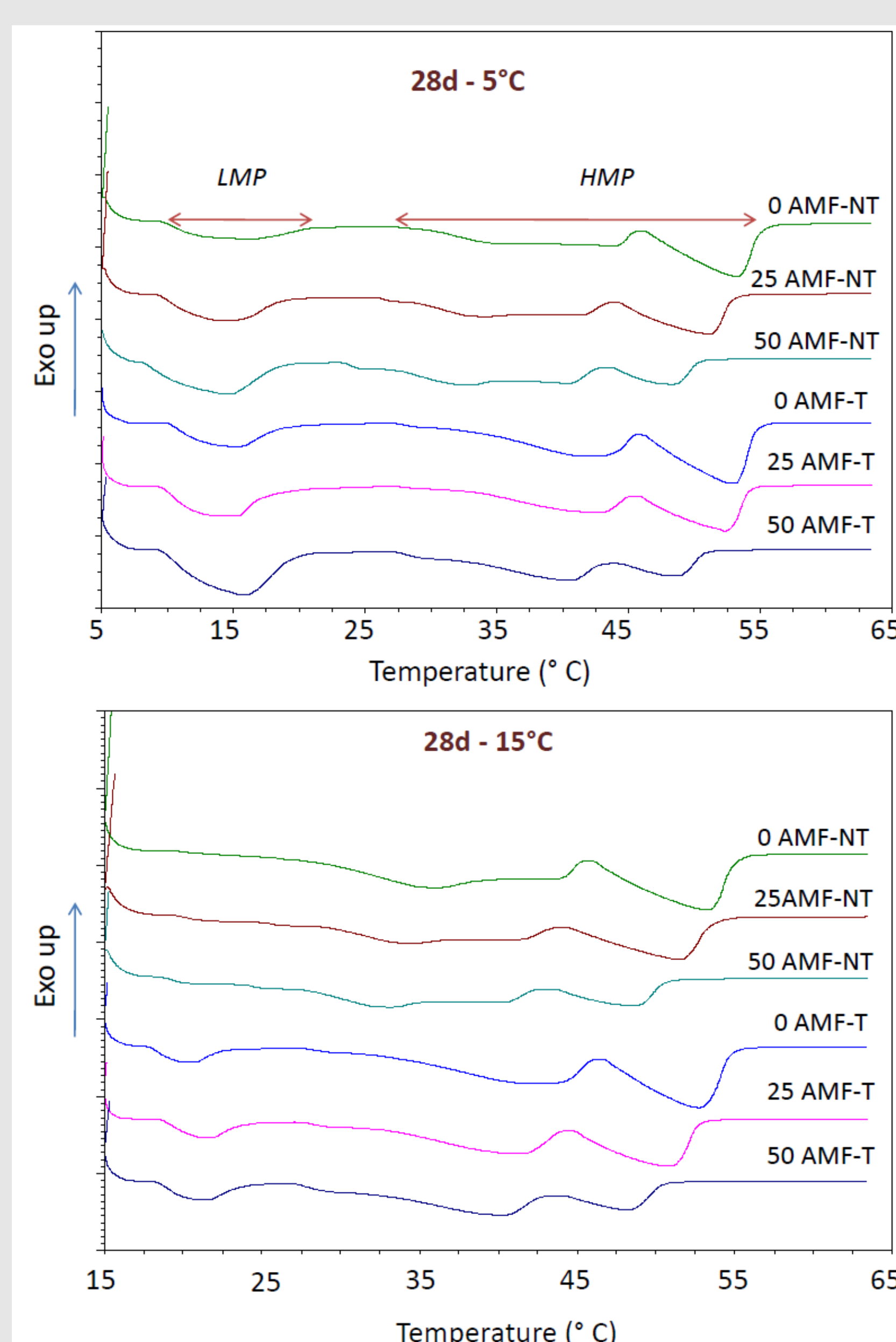


Fig 4. Melting profile of fat blends after longterm storage (28 days) at 5°C and 15°C. LMP: Low melting peak (<30°C); HMP: High melting peak (30°C-55°C)

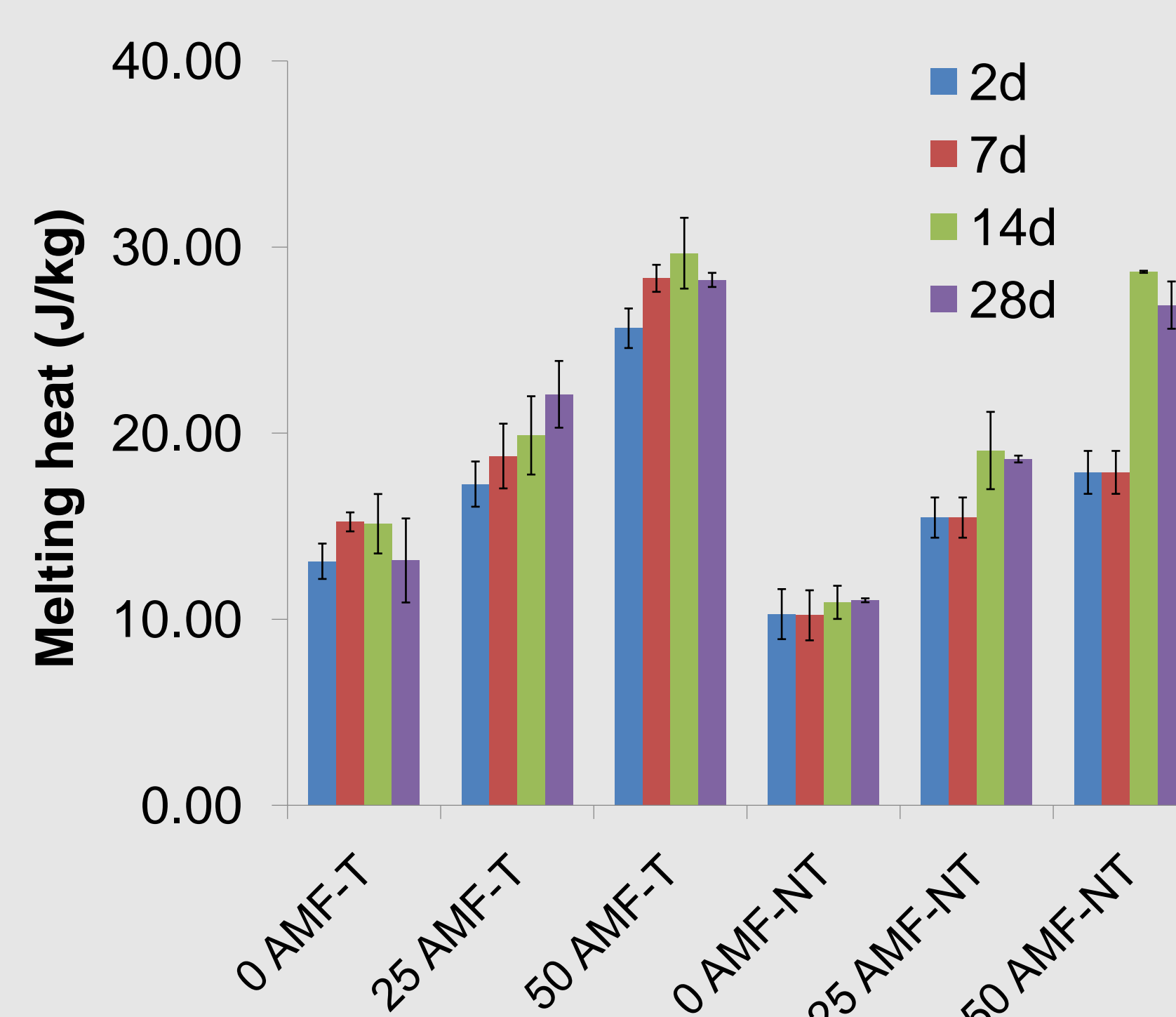


Fig 5. Enthalpy of low melting peak in fat blends during storage at 15°C.

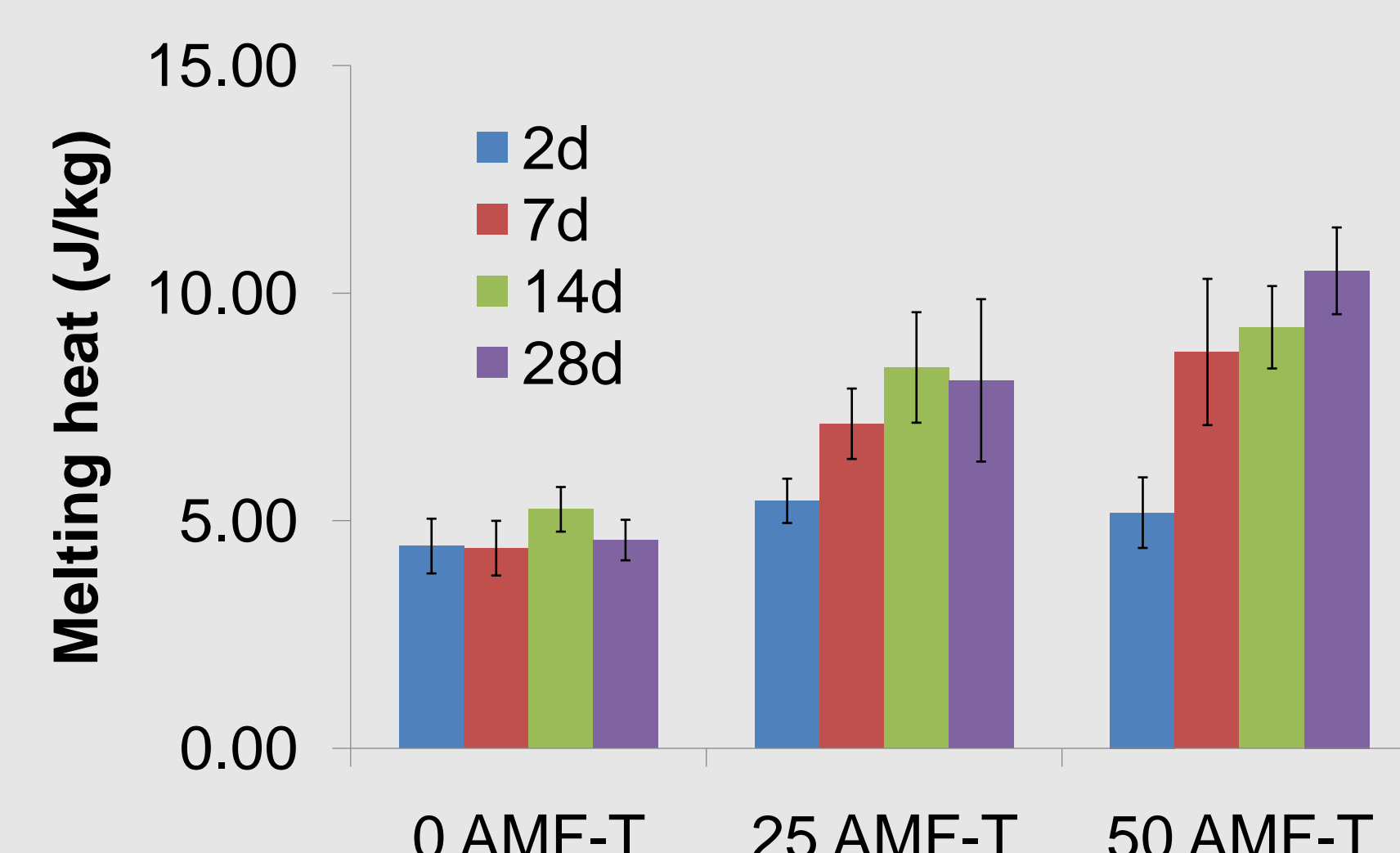


Fig 6. Enthalpy of low melting peak in fat blends during storage at 15°C (For NT samples, LMP and HMP merged together).

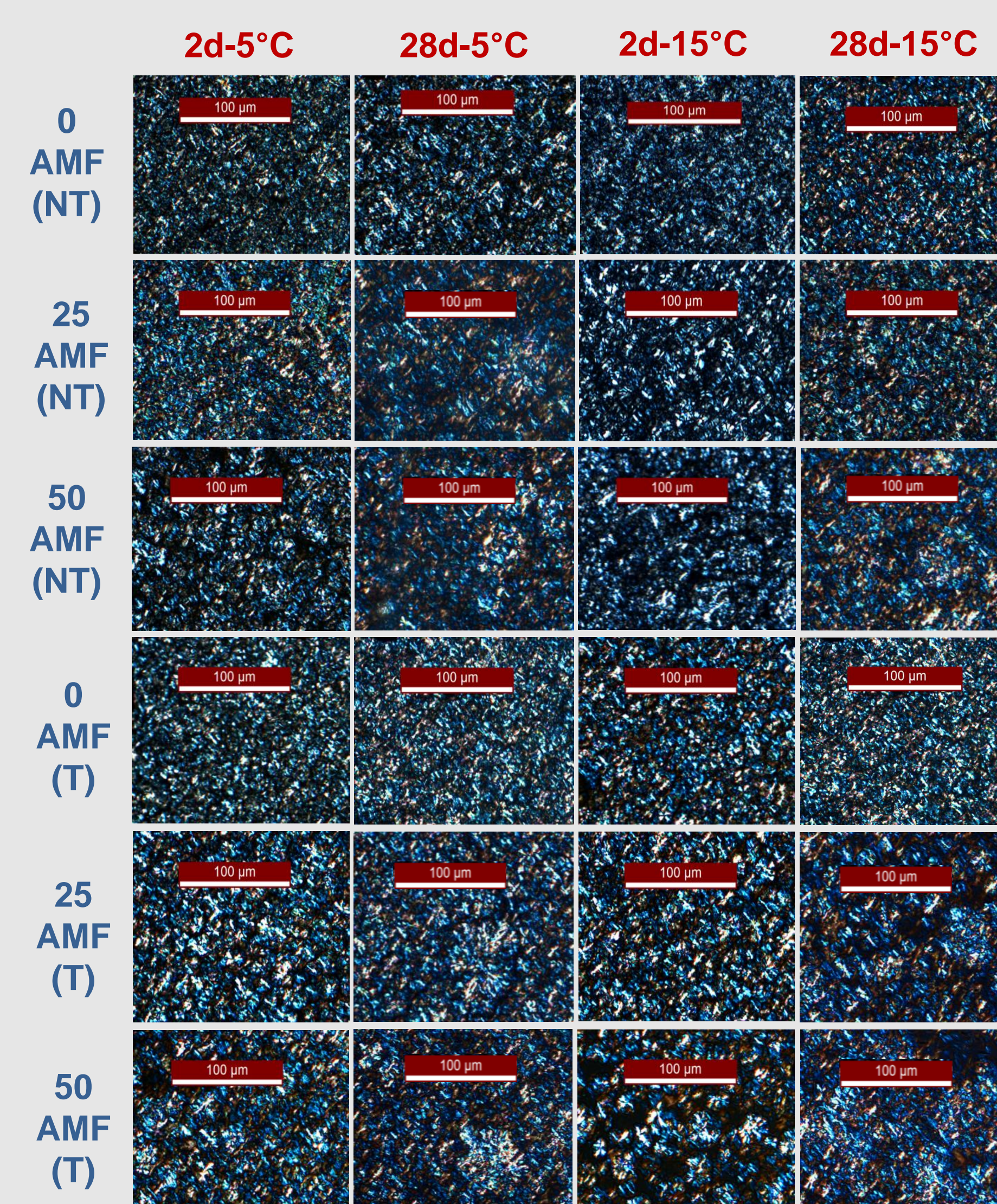


Fig 7. Crystals morphology of fat blends during storage

Conclusion

- At 15°C, crystallization kinetic of three fat blends is similar. At 5°C, fat blends containing AMF (such as 25 AMF and 50 AMF) had slower crystallization kinetic.
- The addition of AMF increased $\Delta H_{\text{low melting peak}}$ and decreased $\Delta H_{\text{high melting peak}}$ of fat blends.
- In fat blends containing AMF, $\Delta H_{\text{low melting peak}}$ tended to increase during storage at 5°C
- The presence of AMF increased the agglomeration between fat crystals in the storage at 5°C
- Tempering changed phase behavior of fat blends and promoted the formation of bigger fat crystals

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