Transitioning of Spent AGR Fuel from Wet to Dry Storage

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Introduction

- After decades of use large quantities of nuclear fuel has accumulated in storage ponds;
- Fuel can not be stored in ponds indefinitely;
- In many countries dry storage of spent nuclear fuel (SNF) is used as an interim measure;
- Key requirements for dry storage are criticality prevention, integrity maintenance and retrievability;
- All of these are affected by corrosion and hence the interaction with water.

"Ongoing Receipt of AGR Fuel | Sellafield Ltd." Accessed July 29, 2014. http://www.sellafieldsites.com/solution/spent-fuel-management/ongoing-receipt-of-agr-fuel/.

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PhD Plan

- Produce and characterise a number of simulant samples.
- Build and commission a macro scale drying rig.
  - Hot gas drying.
  - Vacuum drying
- Carry out mechanical testing on dried samples
- Characterise active samples

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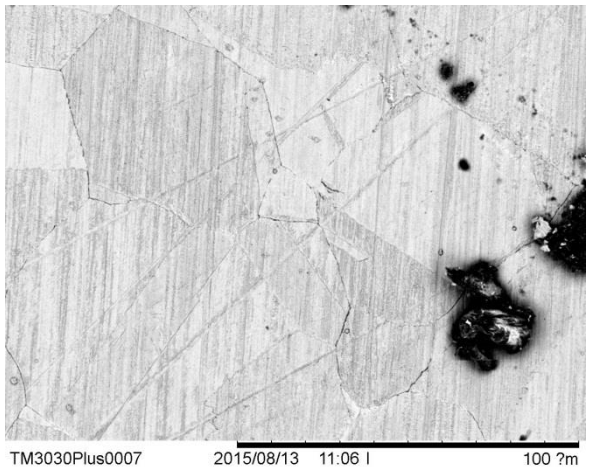
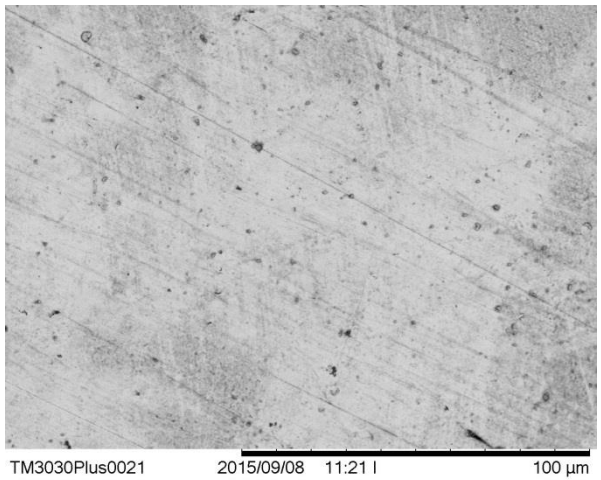
Sample Production

- AISI 310 SS.
- Corrosion in HNO_3 + Cr(VI) and NaOH.
- HNO3 samples showed clear evidence of IGC.
  - Ideal sensitisation conditions found.
- NaOH samples showed no evidence of IGC.





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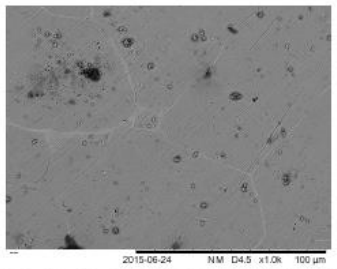
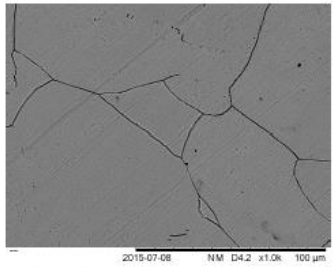
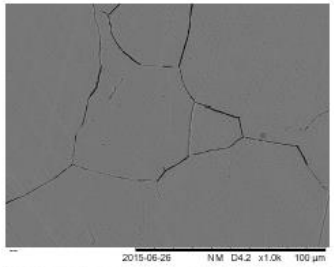
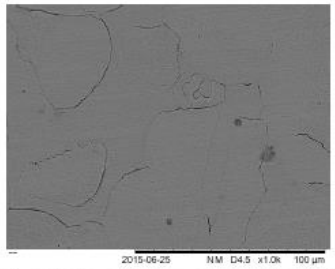
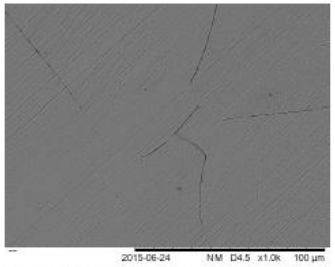
Sample Production

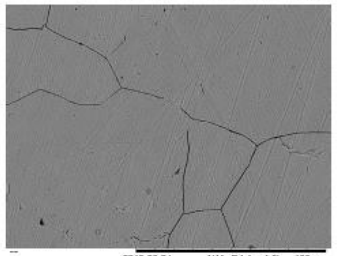


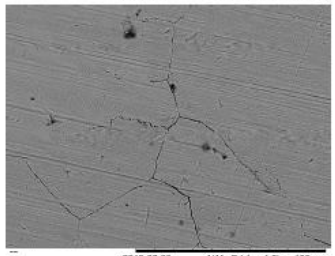


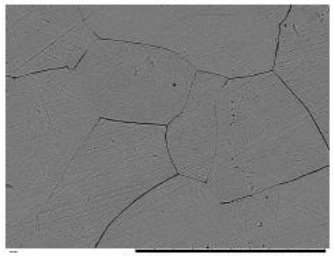


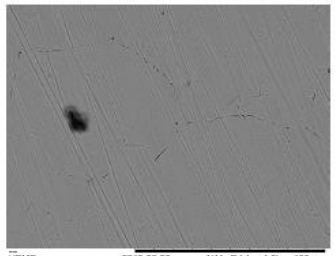


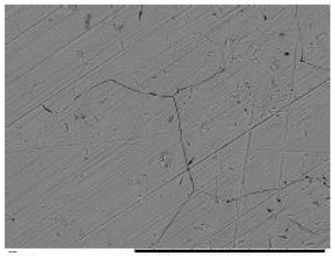


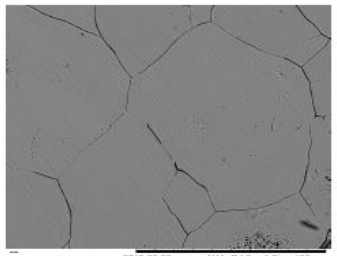












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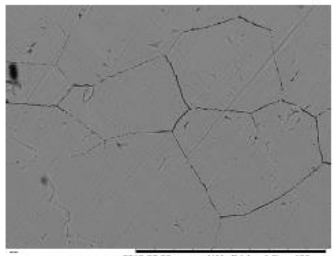

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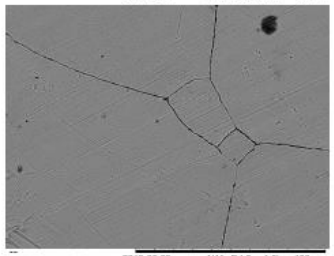

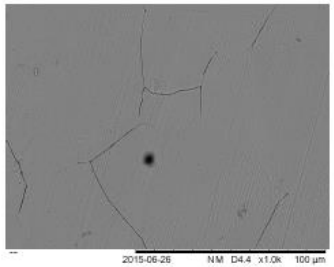

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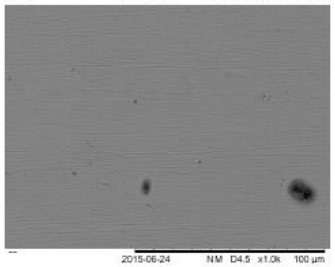

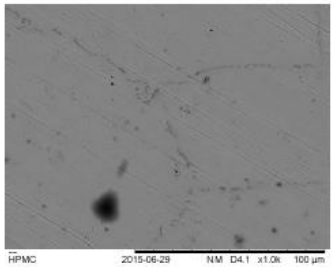

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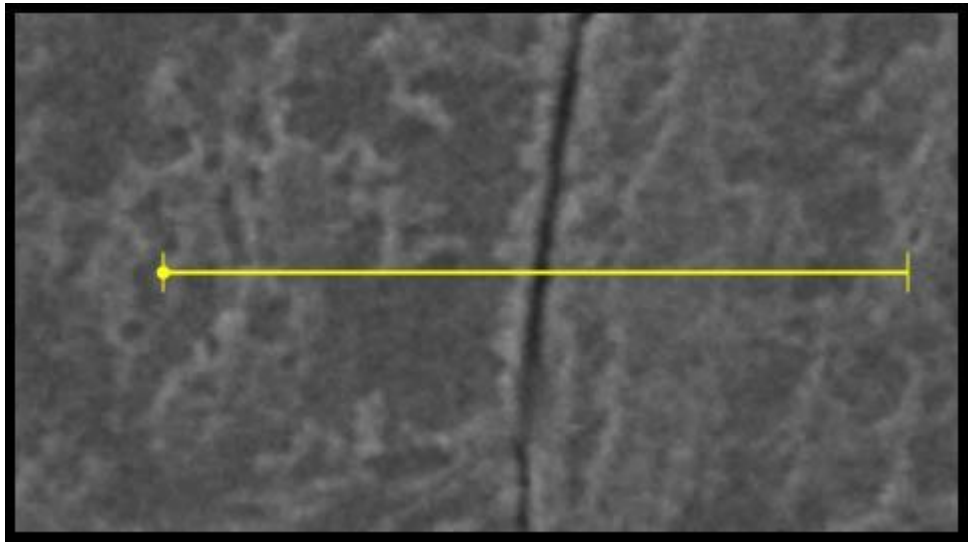
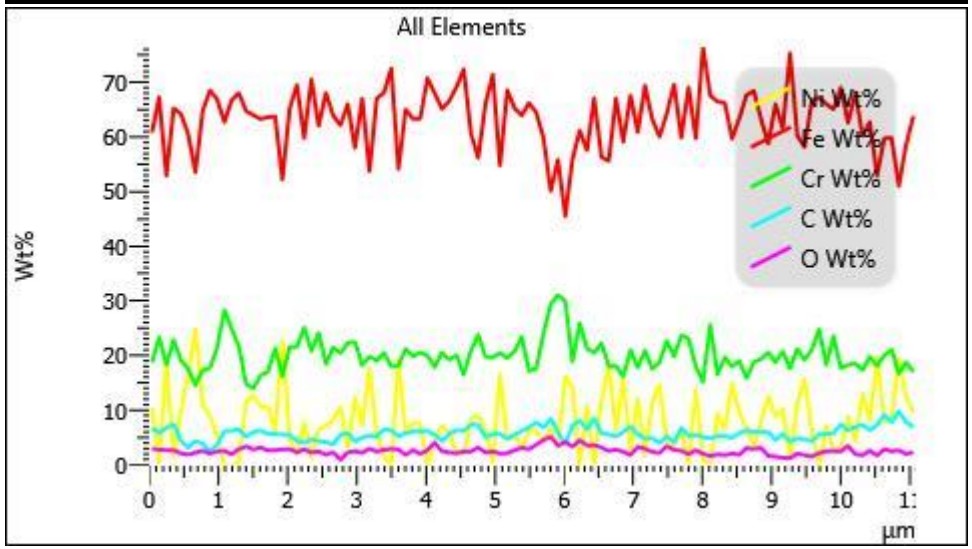
Results-EDX





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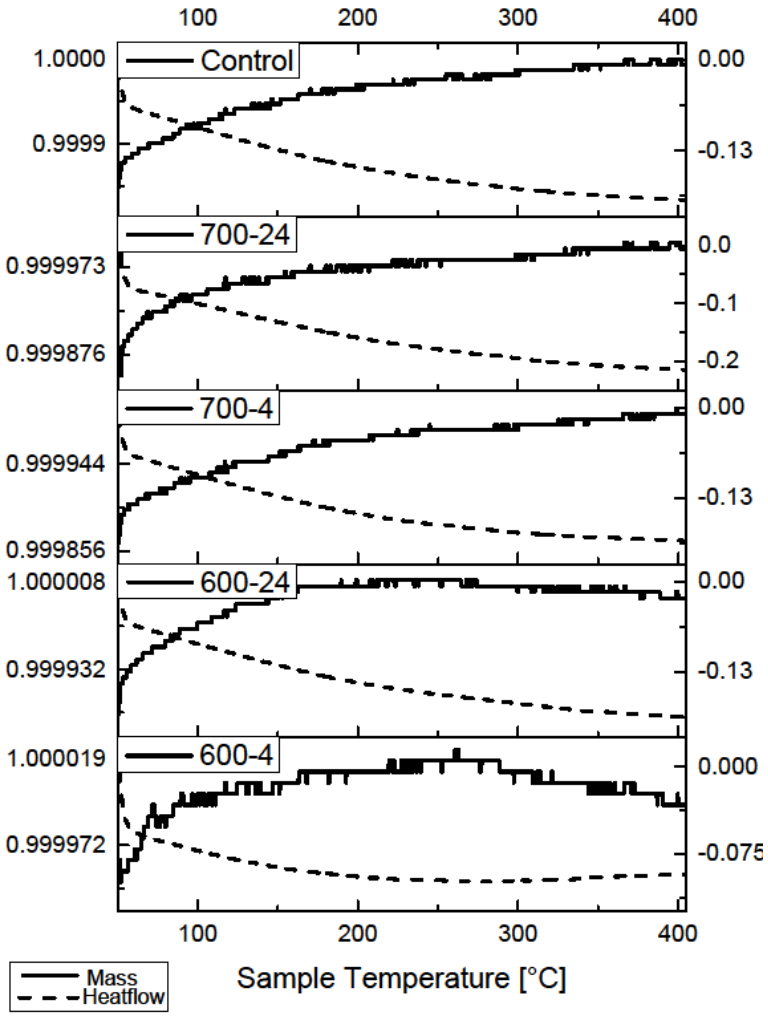
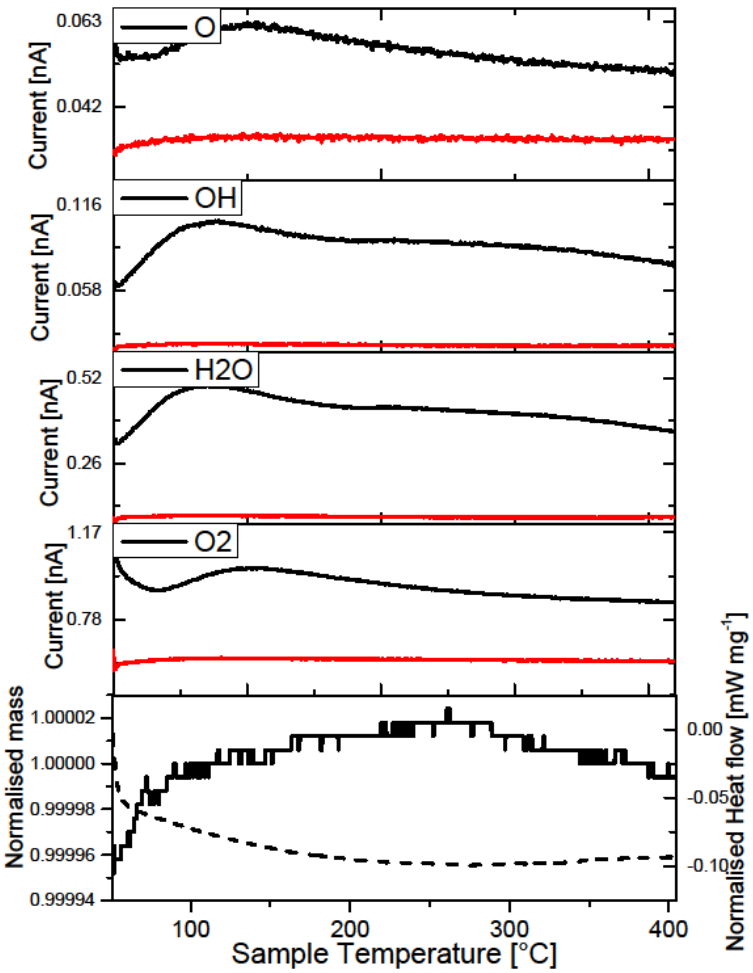
Results-TGA/DSC/MS





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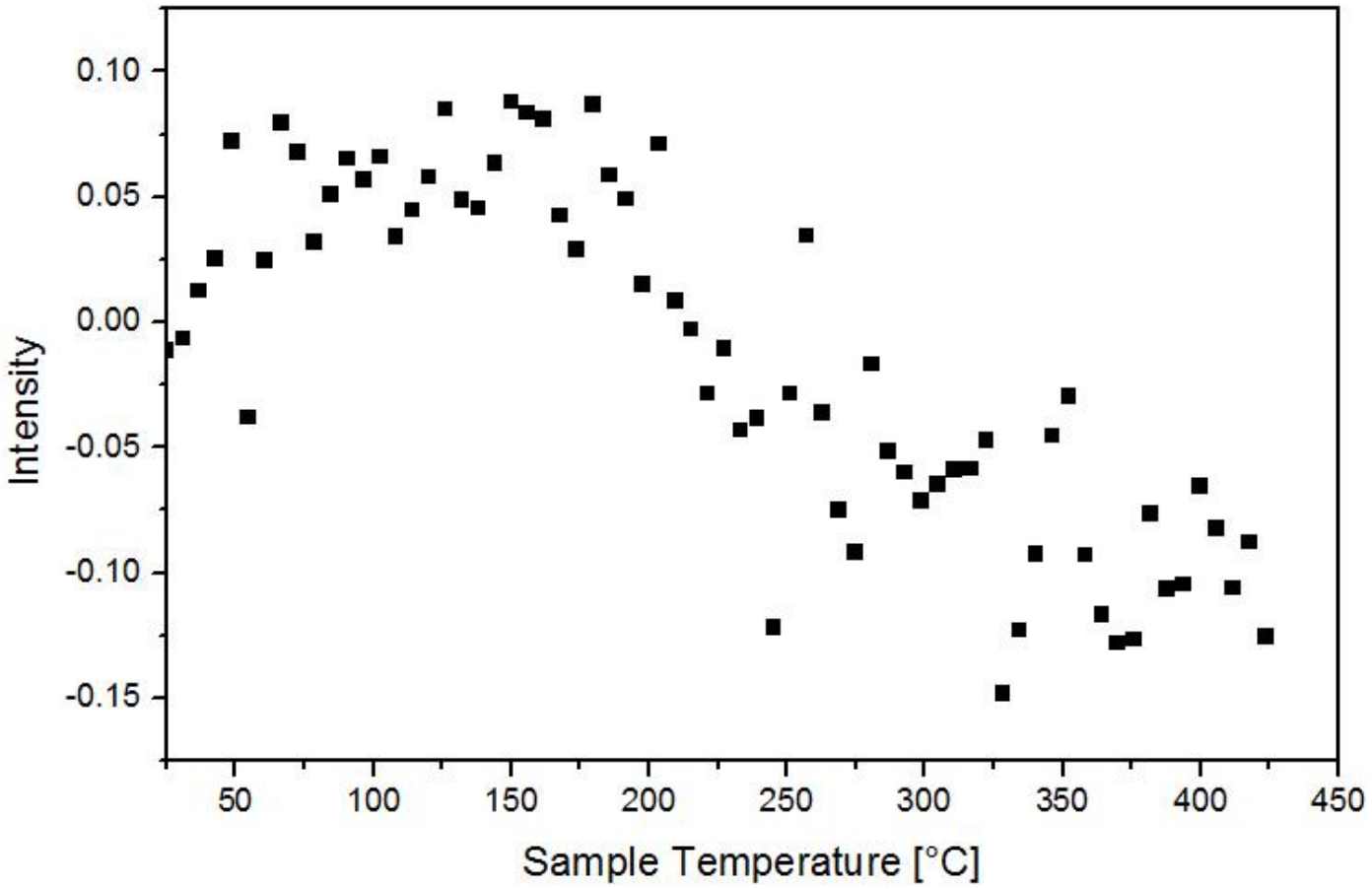
Results-FTIR



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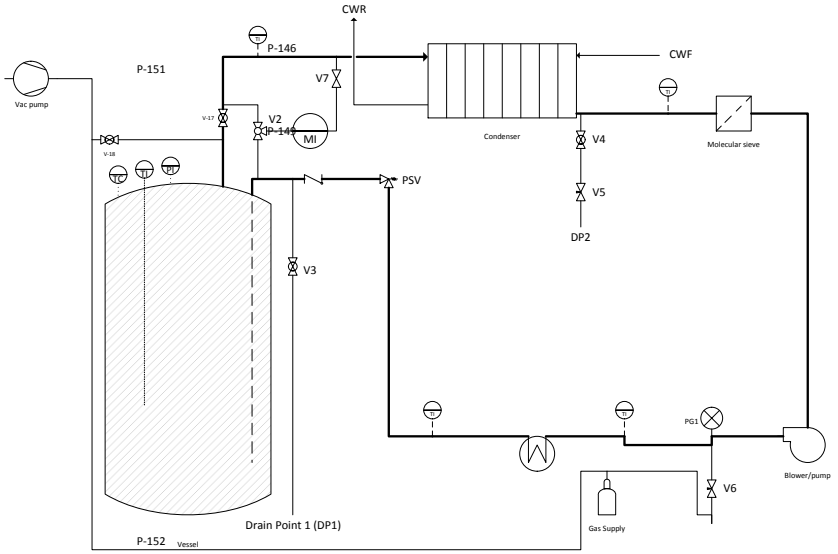
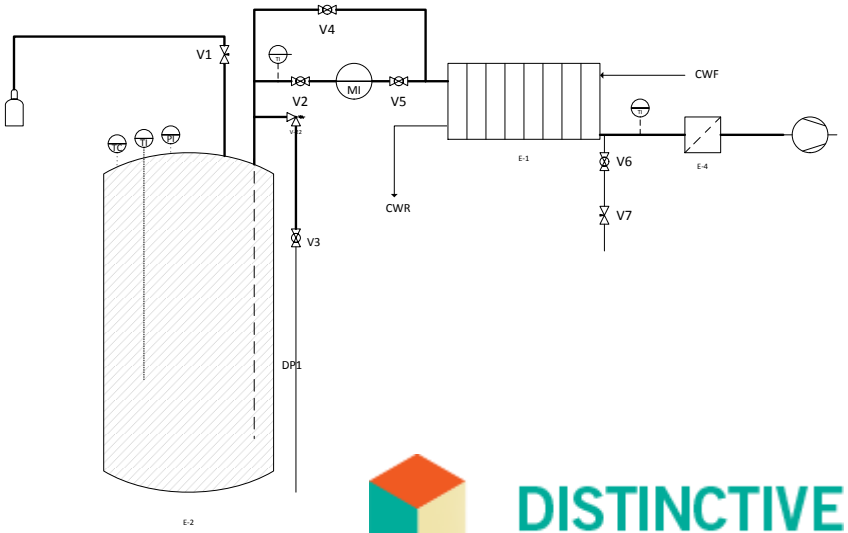
Macro Scale Drying

- Comparison of two drying methods.
  - Hot gas drying.
  - Vacuum drying.
- Different drying tests.
  - No sample.
  - Simple Samples.
  - Complex Samples.
- Comparison
  - Cost, time, efficiency.





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Summary

- IGC from boiling in HNO_3 + Cr(VI).
- Accelerated storage in NaOH shows no IGC.
- Bound water is very difficult to detect on SS oxides.
- Drying rig being planned.
- Tests to begin in the new year.

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