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# Understanding the evolution of an interface during the dissolution of Nd-doped $UO_2$ by macro-/microscopic dual approach

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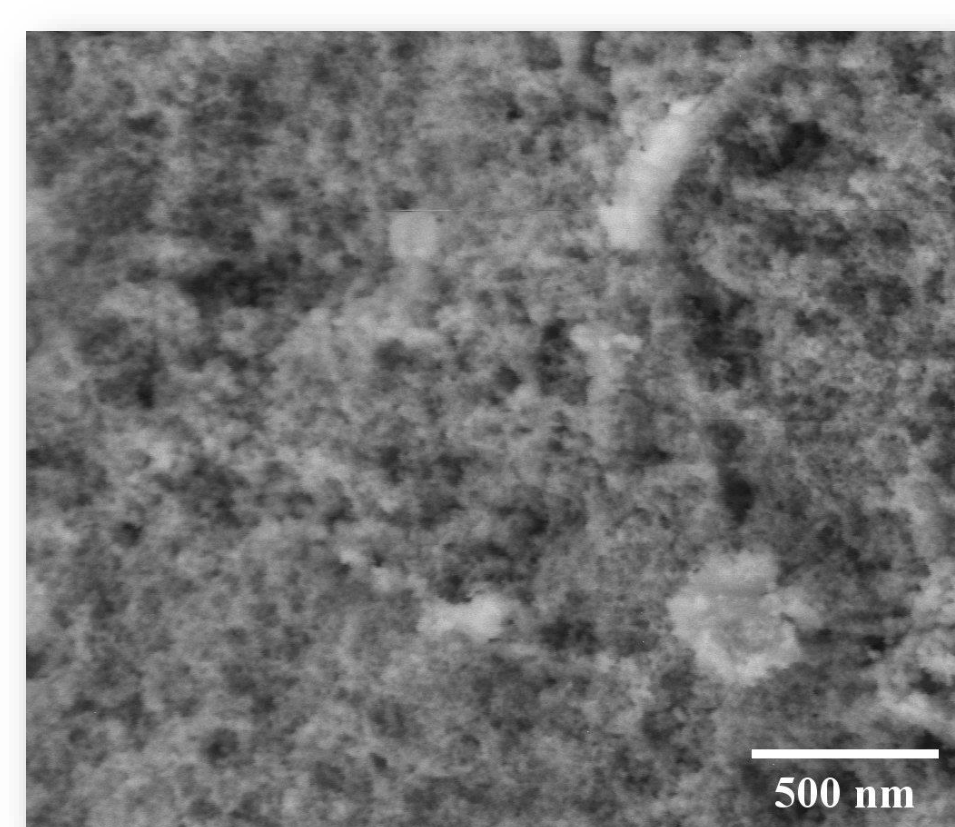
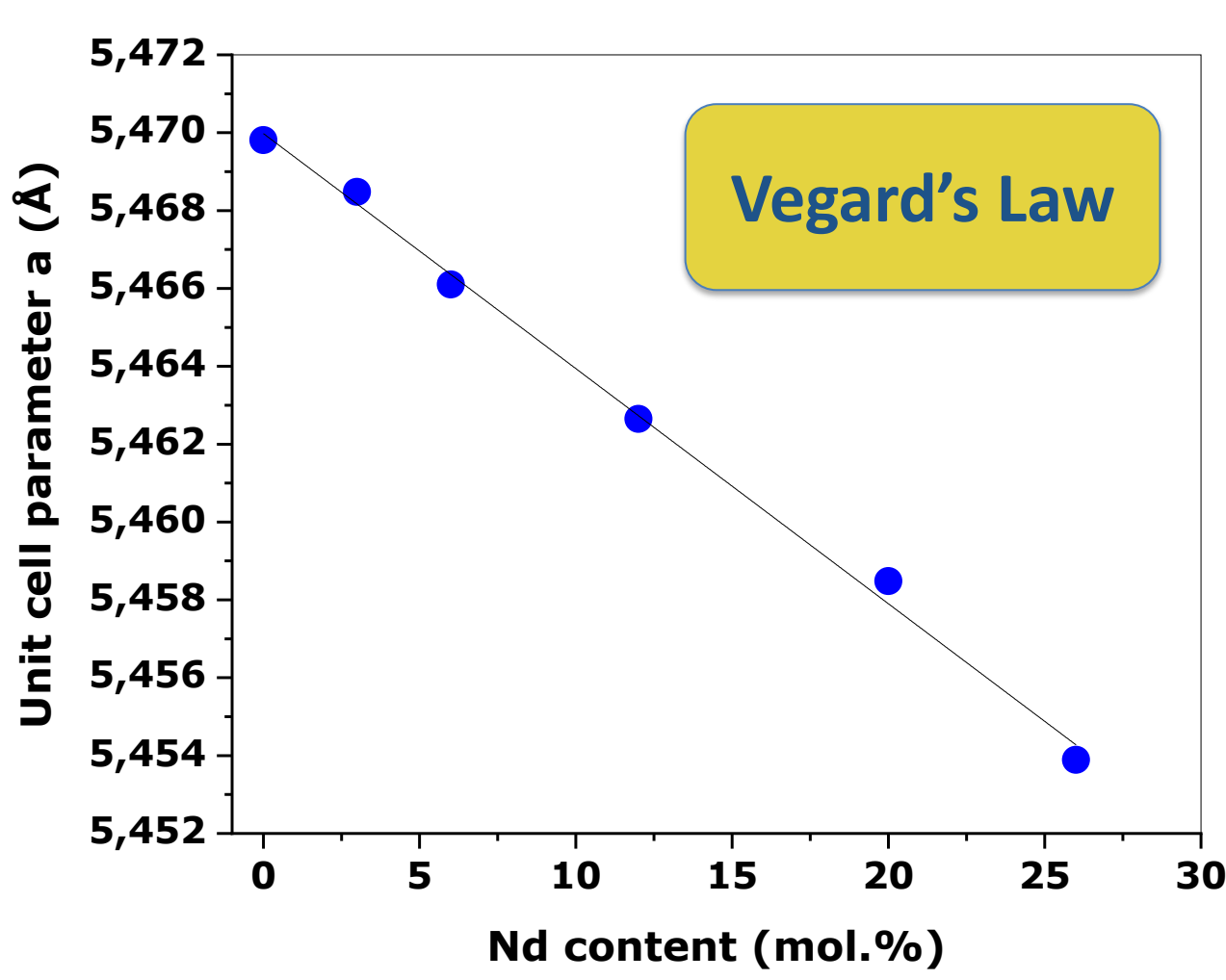
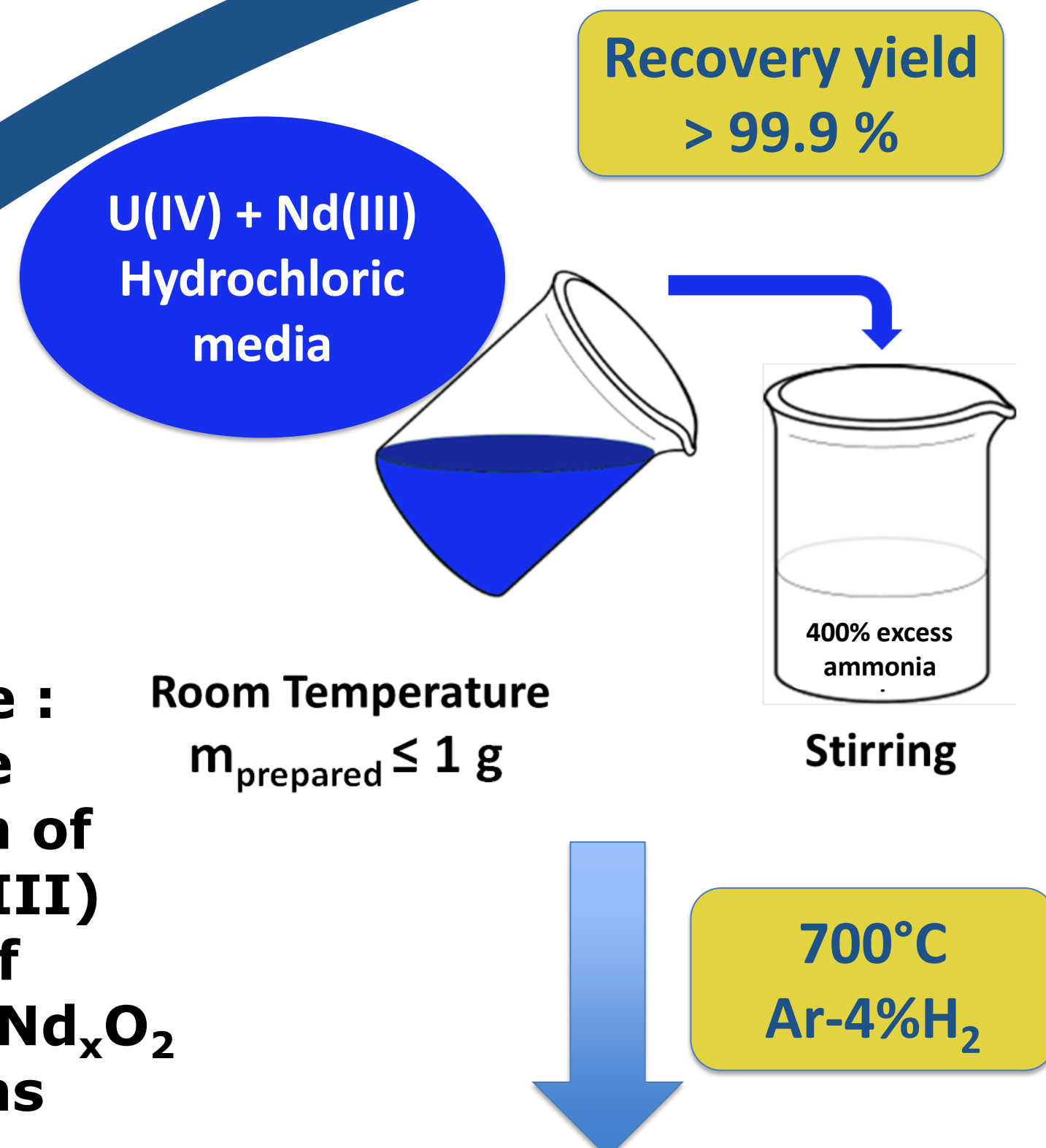
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## Main objectives

Recycling of actinides is a key issue to consider in order to preserve natural fissile resources and to reduce the long-term radiotoxicity of high-level waste in deep geological disposal. Due to the high radioactivity of the spent nuclear fuel, the use of model compounds is often required to understand their behavior during reprocessing. Thus, this work was focused on the elaboration of a panel of Nd-doped  $UO_2$  samples and their sintering under reducing or inert atmosphere. Then, the dissolution kinetics and mechanisms associated were studied during dissolution experiments using a macro-/microscopic dual approach.

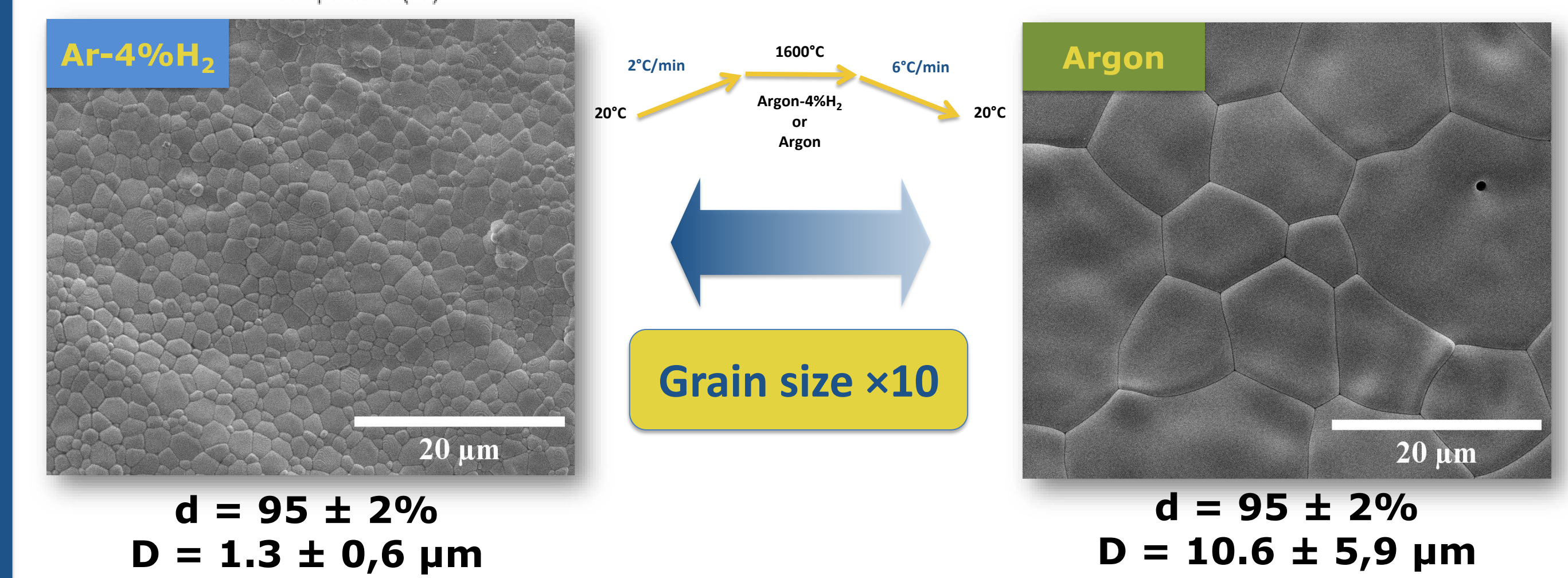
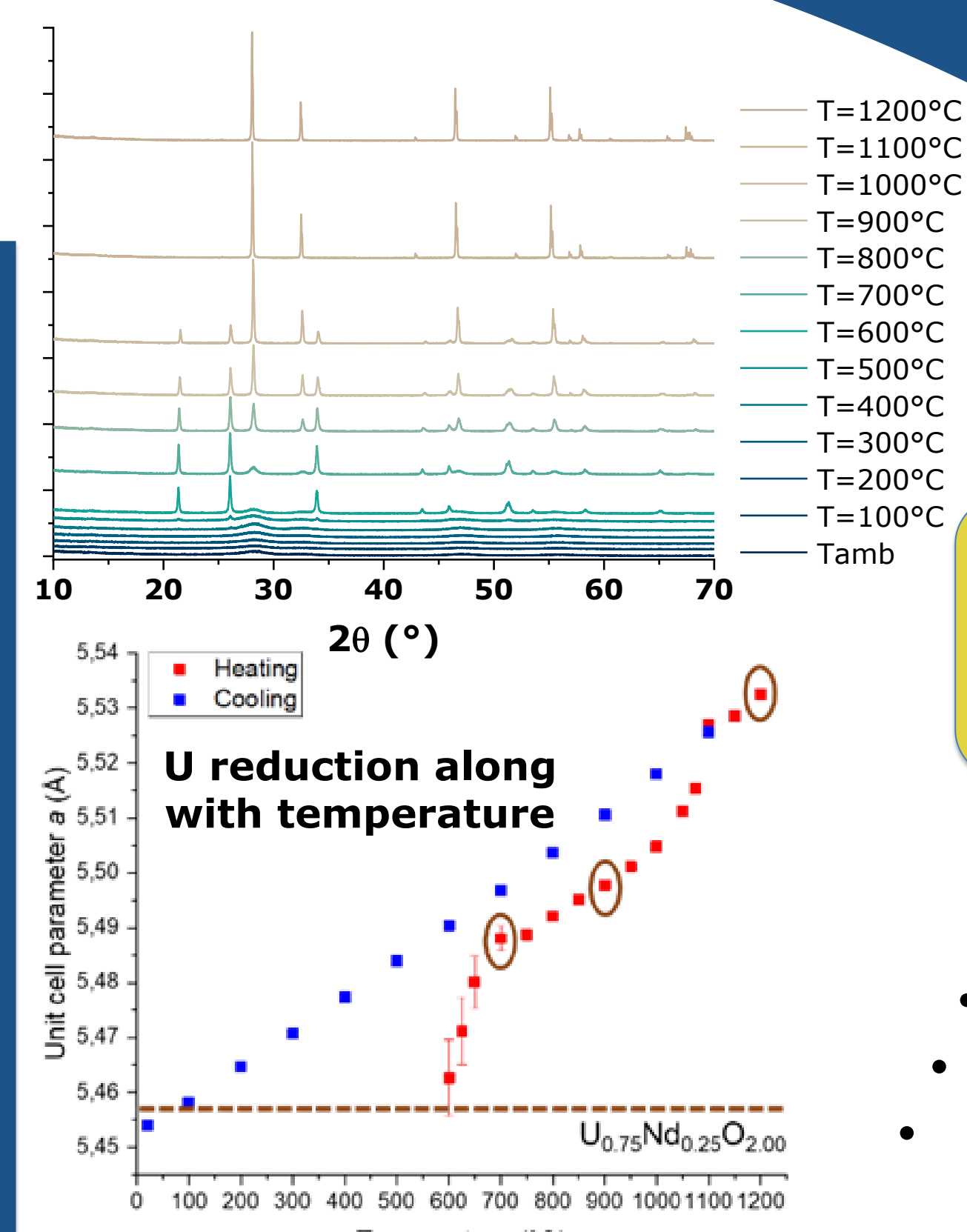
### Synthesis

From the precursor to the targeted material

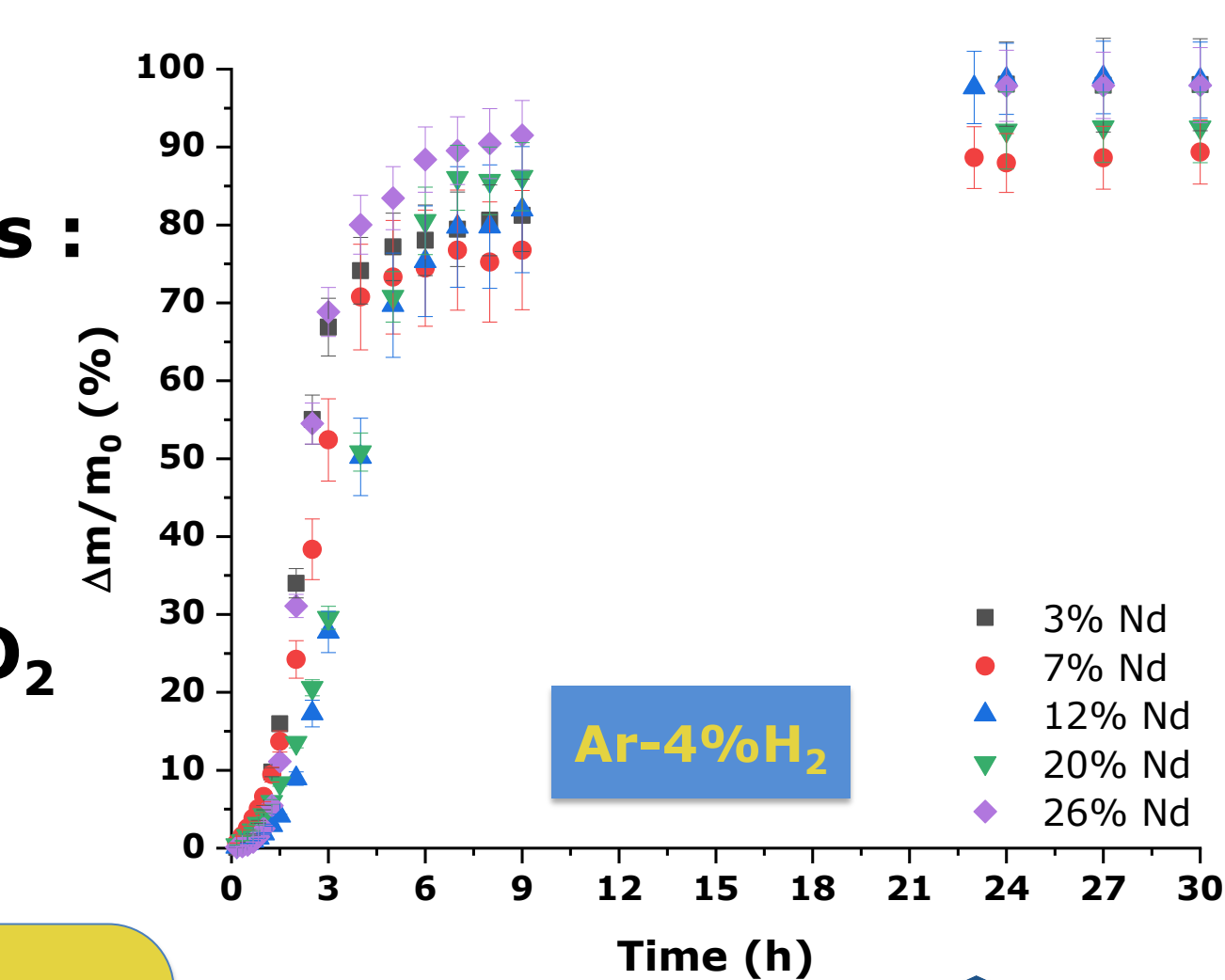


### Sintering

From the powder to the dense pellet

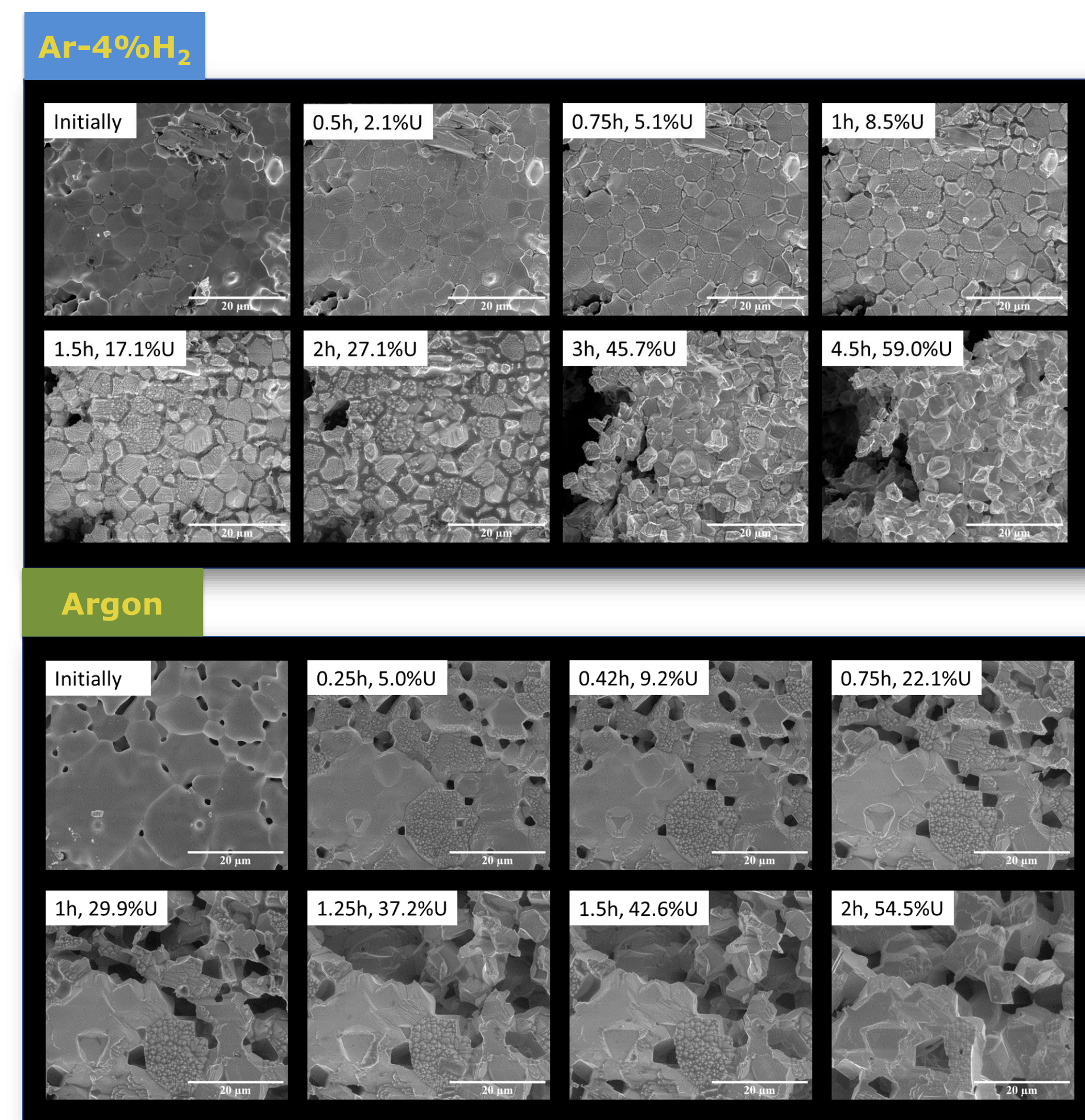
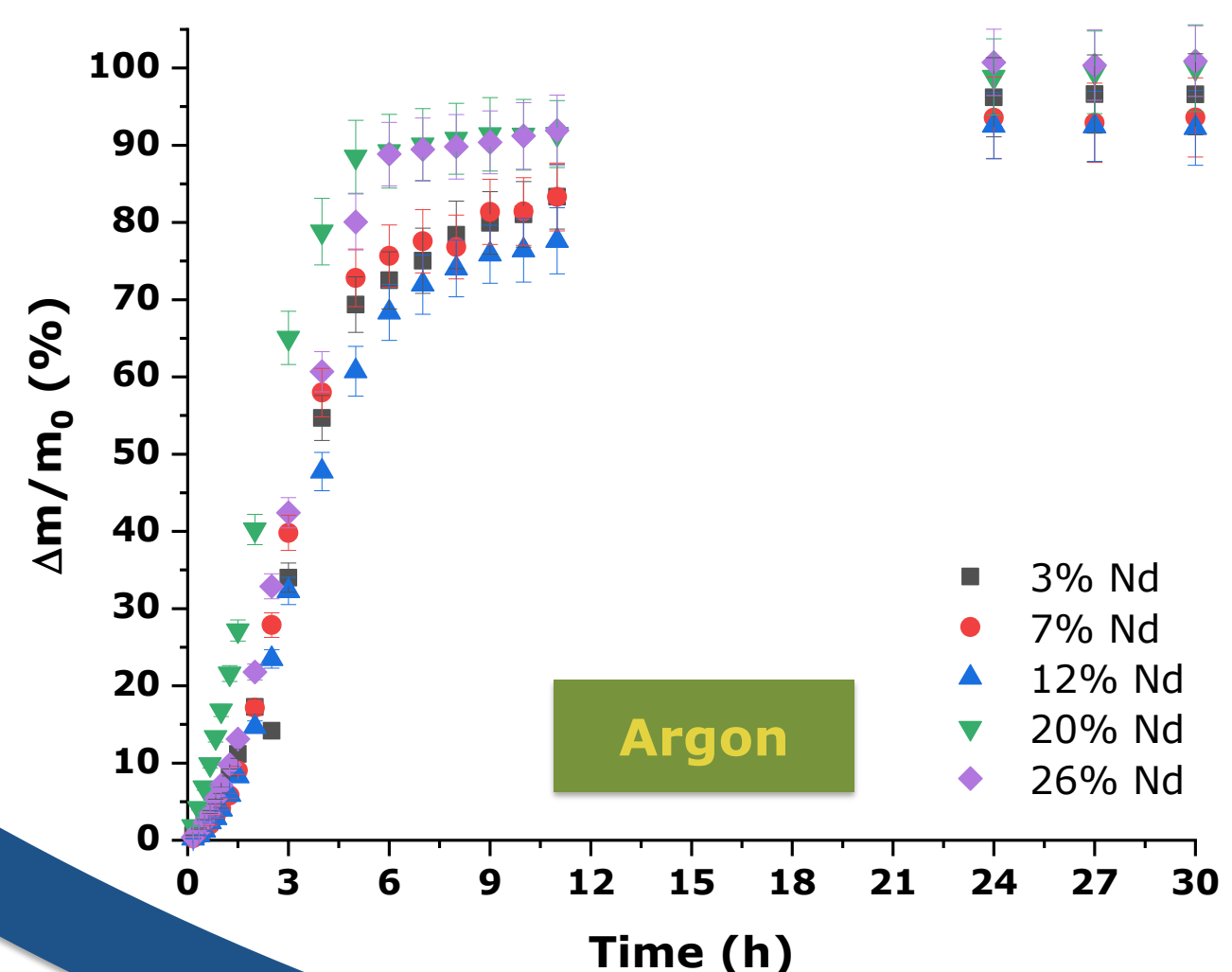


Dissolution of  $U_{1-x}Nd_xO_{2-y}$  samples :  
• Congruent nature :  $R_L(U) \approx R_L(Nd)$   
• Presence of Ln lowers the chemical durability : factor  $\approx 20$  for  $U_{0.8}Nd_{0.2}O_2$  vs.  $UO_2$



No impact of the sintering atmosphere at the macroscopic scale

Experimental parameters :  
2M  $HNO_3$   
T = 60°C  
Static conditions

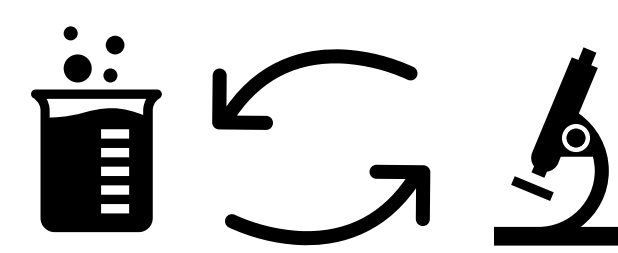


Preferential dissolution at the grain boundaries

≠ Mechanisms

Homogeneous dissolution

Operando monitoring of the Solid/Liquid interface evolution during dissolution by ESEM



### Interface monitoring

Microscopic description of the evolving interface

### Dissolution experiments

Macroscopic description of the chemical durability

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