

# Accelerated iterative sampling

**Gareth Conduit**

Patent GB1302743.8 (2013)

Patent GB1307533.8 (2013)

Patent GB1307535.3 (2013)

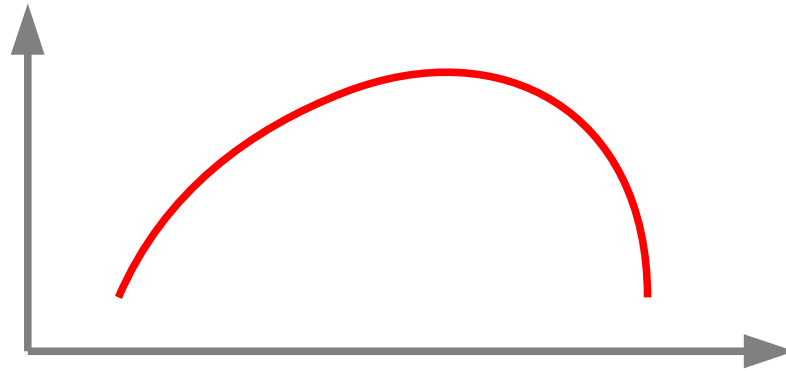
Acta Materialia, **61**, 3378 (2013)

Rolls-Royce Group plc invention submission NC12261 (2012)

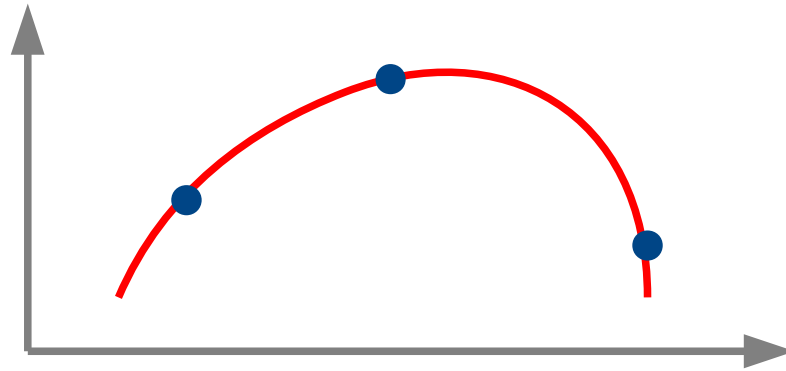
Rolls-Royce Group plc invention submission NC13006 (2013)

**TCM Group, Department of Physics**

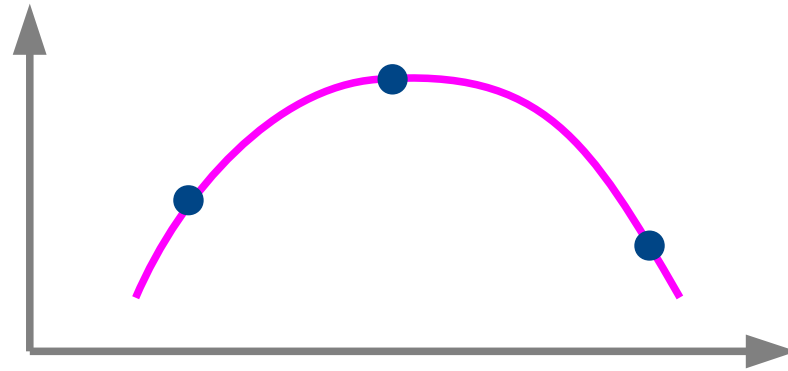
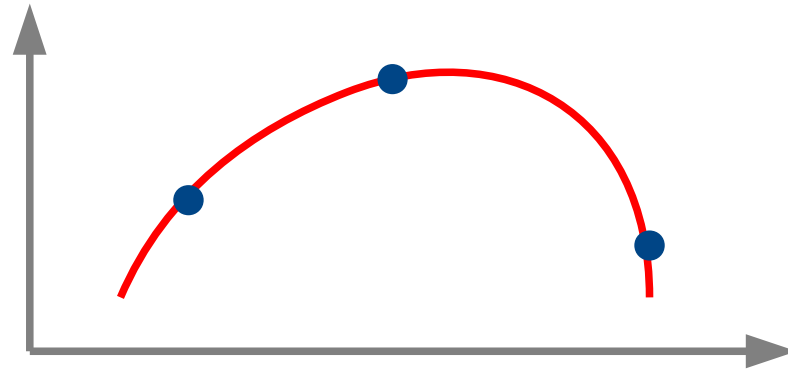
# Accelerated sampling



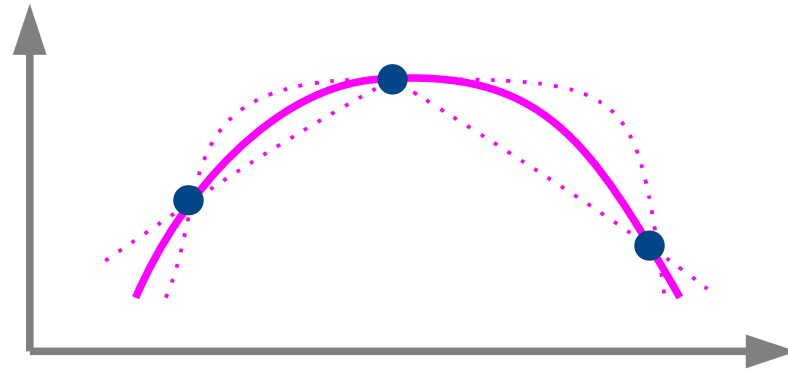
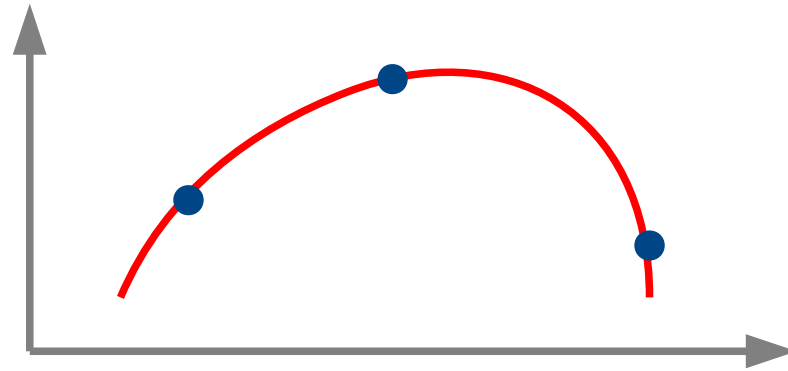
# Accelerated sampling



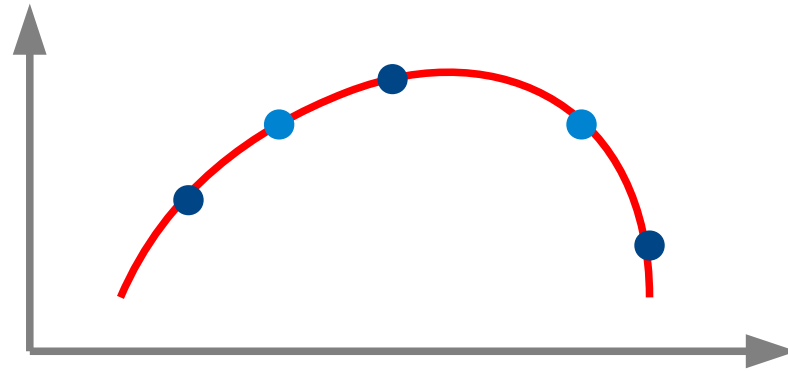
# Accelerated sampling



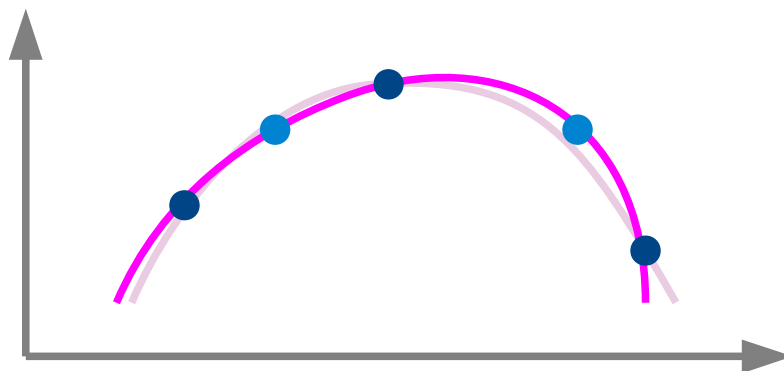
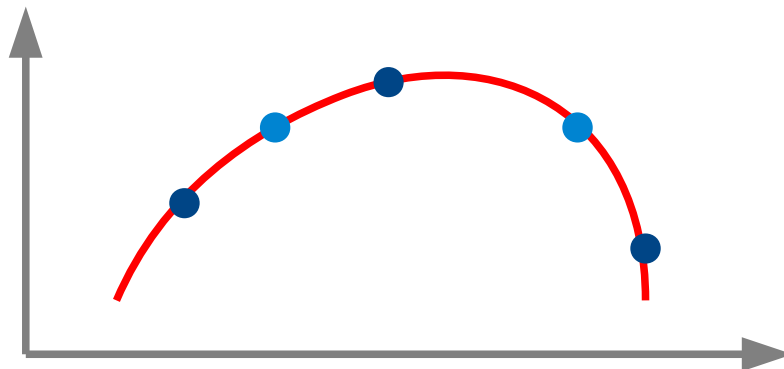
# Accelerated sampling



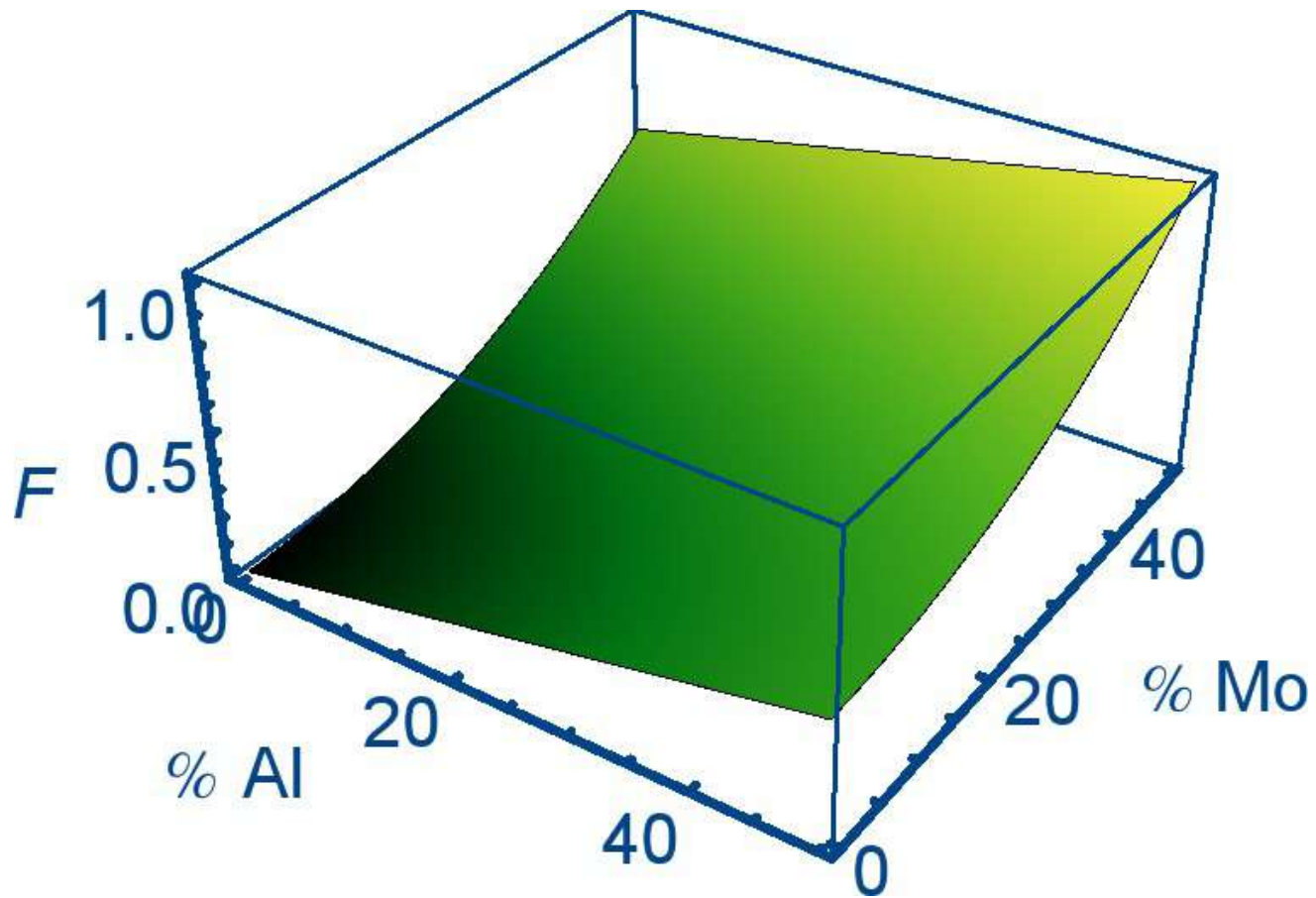
# Accelerated sampling



# Accelerated sampling

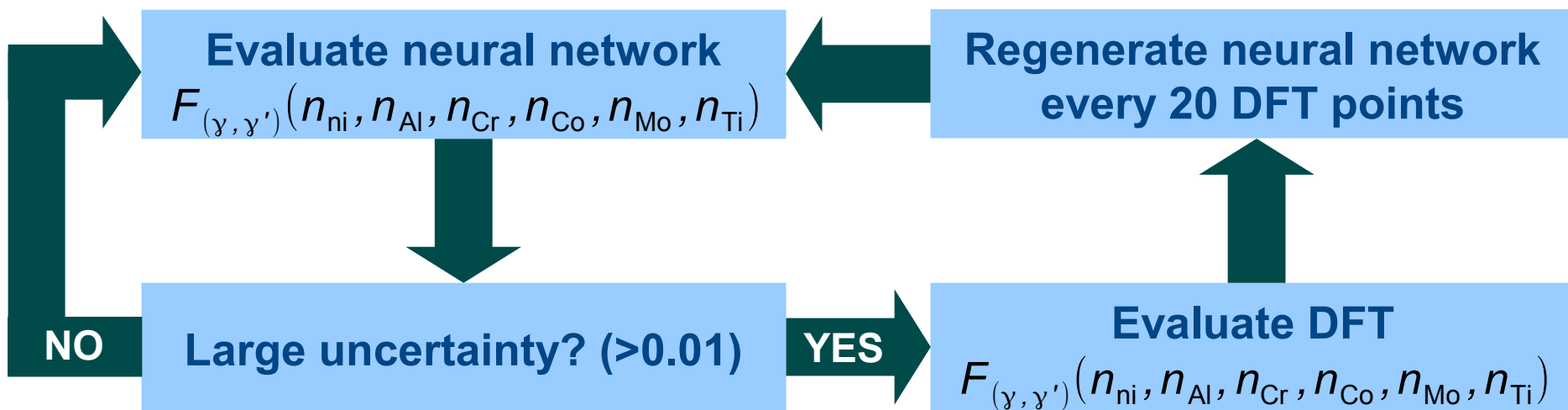


# Reinforcement learning

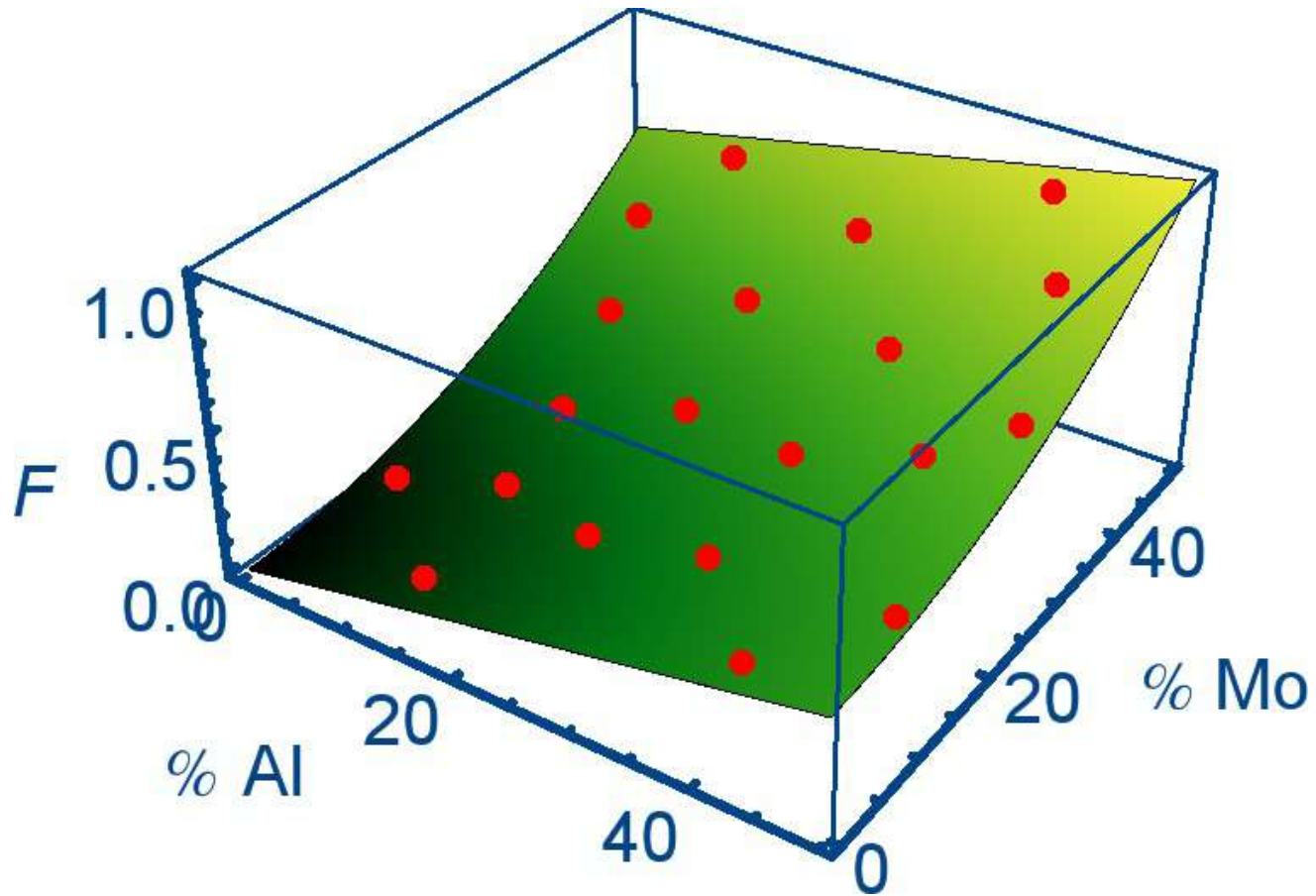




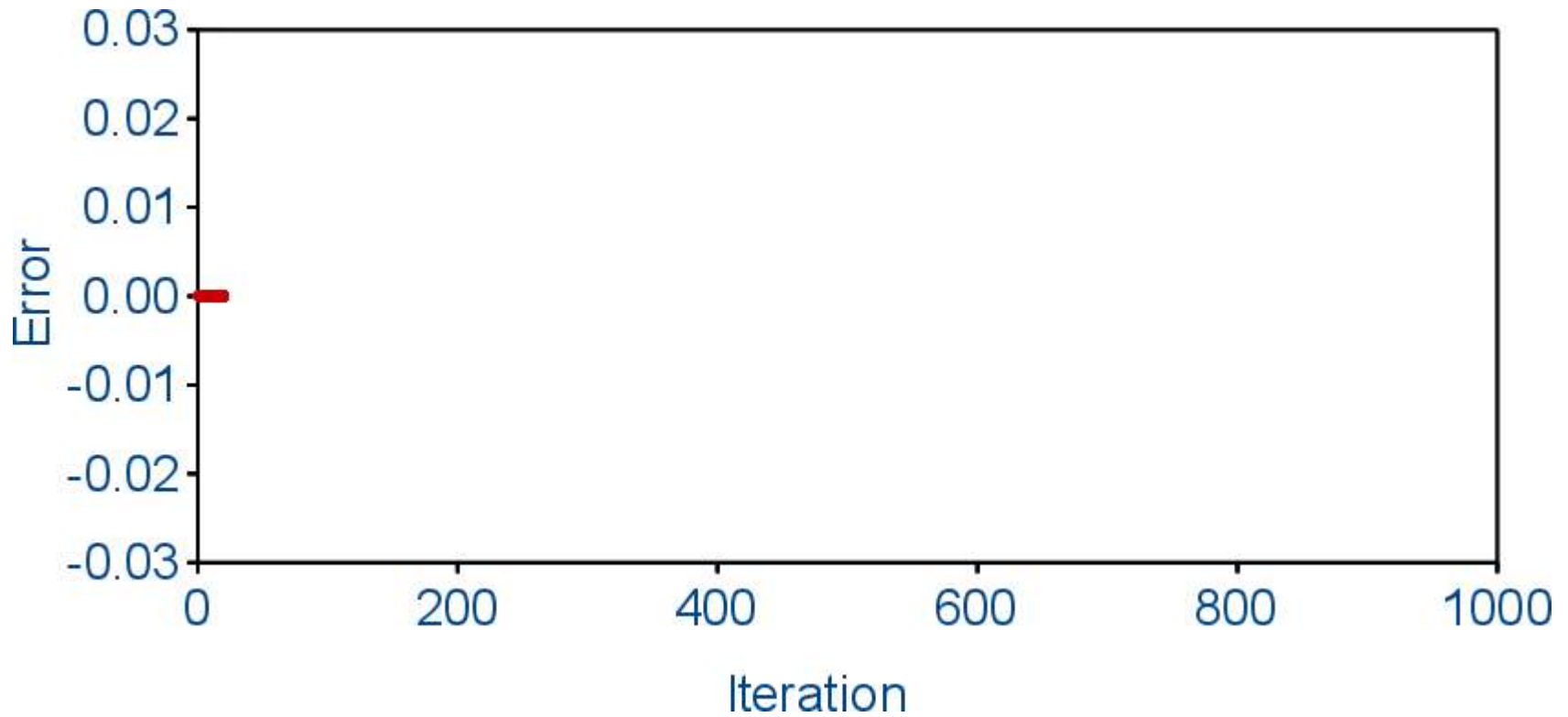
# Reinforcement learning



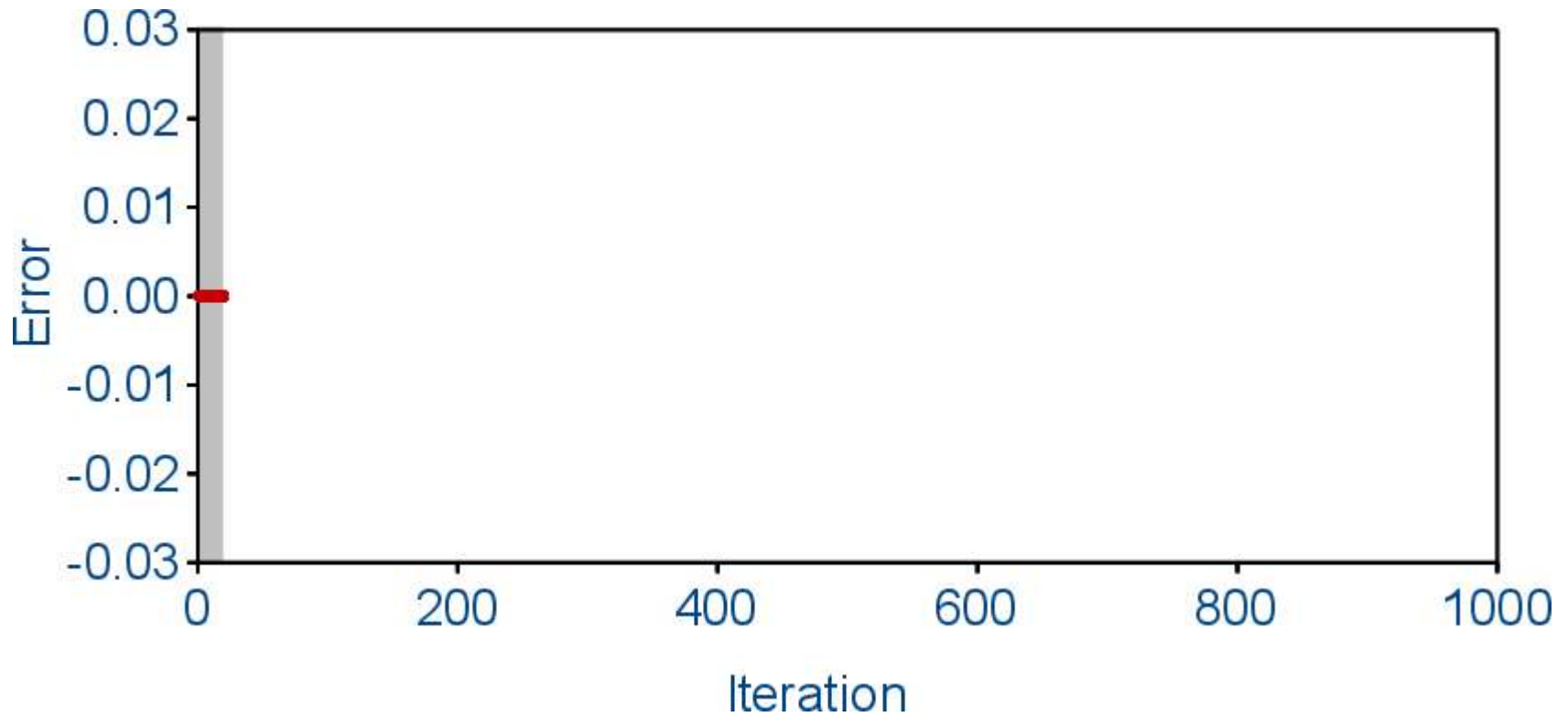
# Reinforcement learning



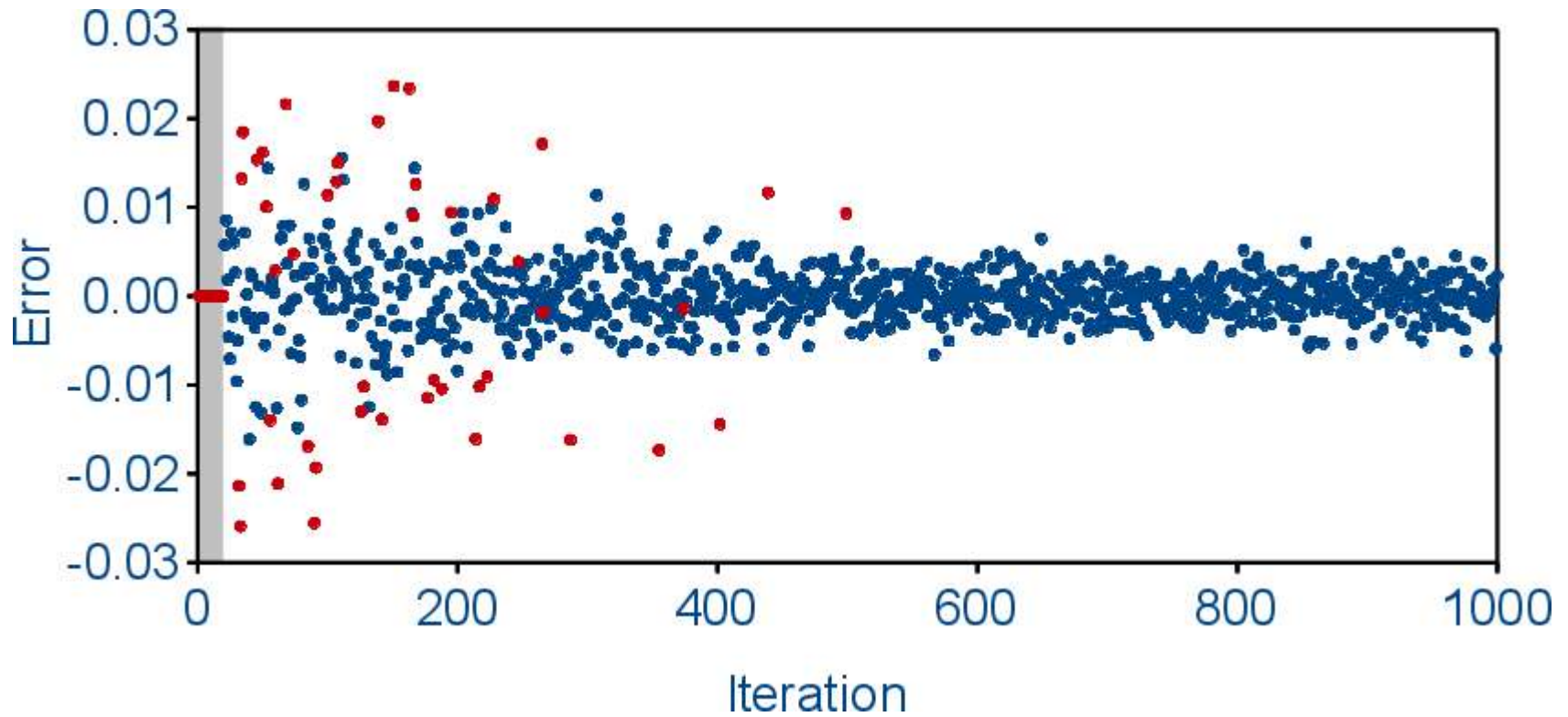
# Reinforcement learning



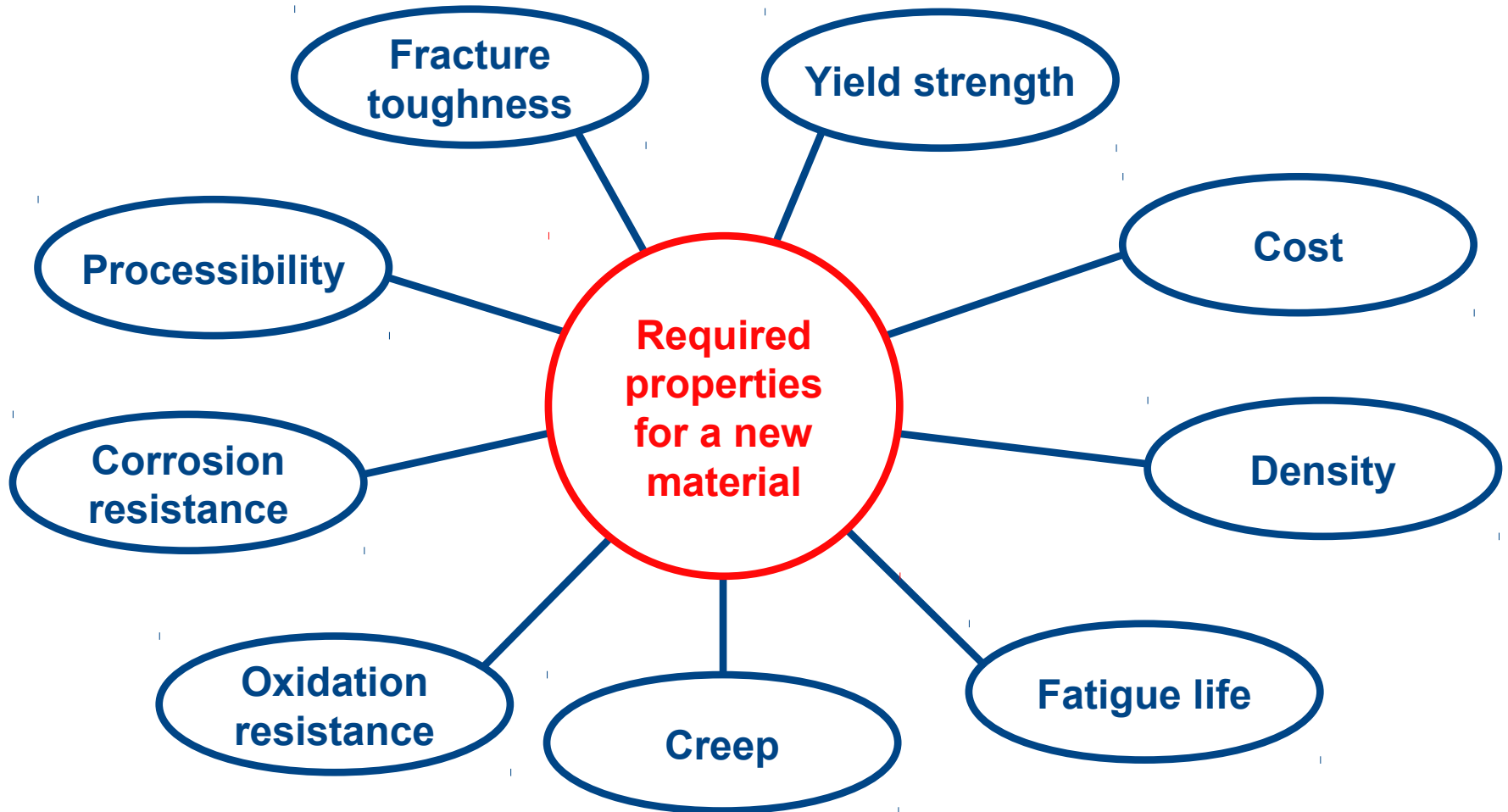
# Reinforcement learning



# Reinforcement learning



# Designing a new material – what is required ?



# Multidimensional design space

**Cr**



**Co**



**Mo**



**W**



**Ta**



**Nb**



**Al**



**Ti**



**Fe**



**Mn**



**Si**



**C**



**B**



**Zr**



**Cu**



**N**



**P**



**V**



**Hf**



**Mg**



**Ni**



**Heat treatment**

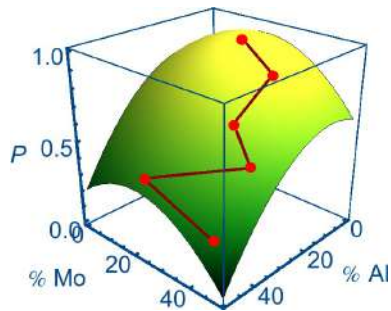




# Concurrent materials design

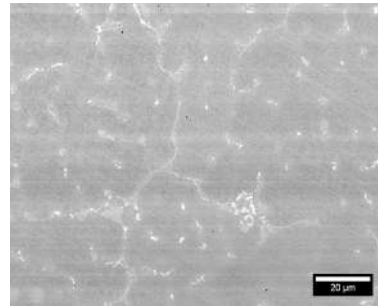
## Discovery algorithm

Patent GB1302743.8 (2013)



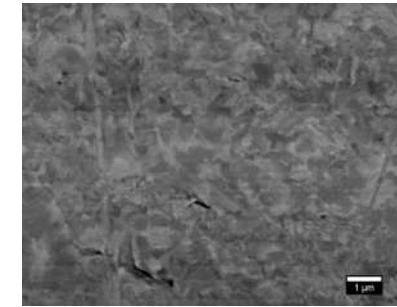
## Mo-Hf forging alloy

Patent GB1307533.8 (2013)



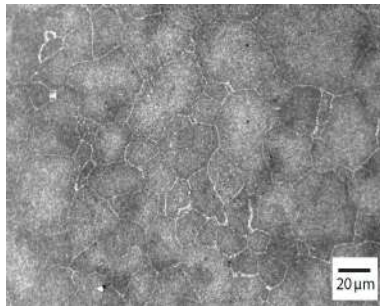
## Mo-Nb forging alloy

Patent GB1307535.3 (2013)



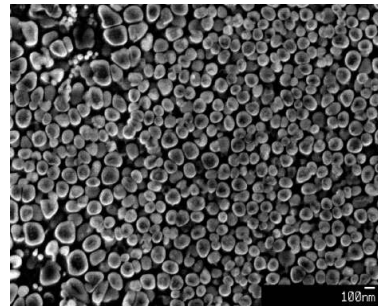
## RR1000 grain growth

Acta Materialia, **61**,  
3378 (2013)



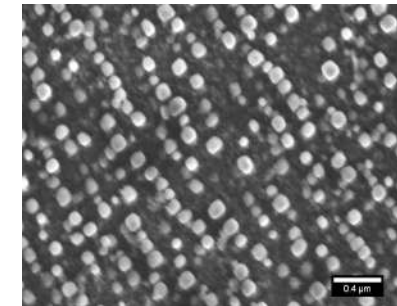
## Ni disc alloy

Rolls-Royce invention  
NC12261 (2012)



## Ni combustor liner

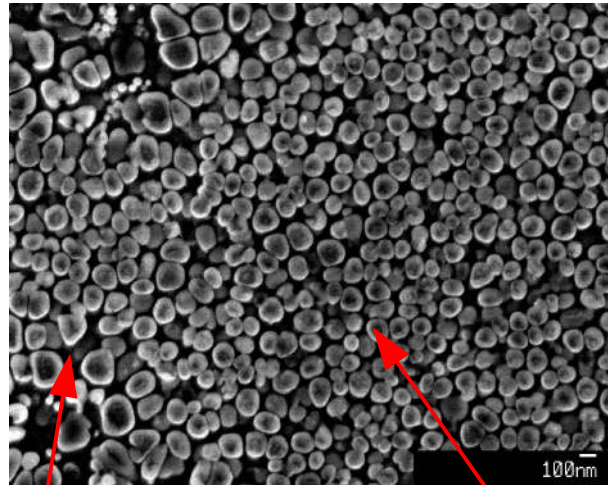
Rolls-Royce invention  
NC13006 (2013)





# Electron micrograph – Ni disc alloy

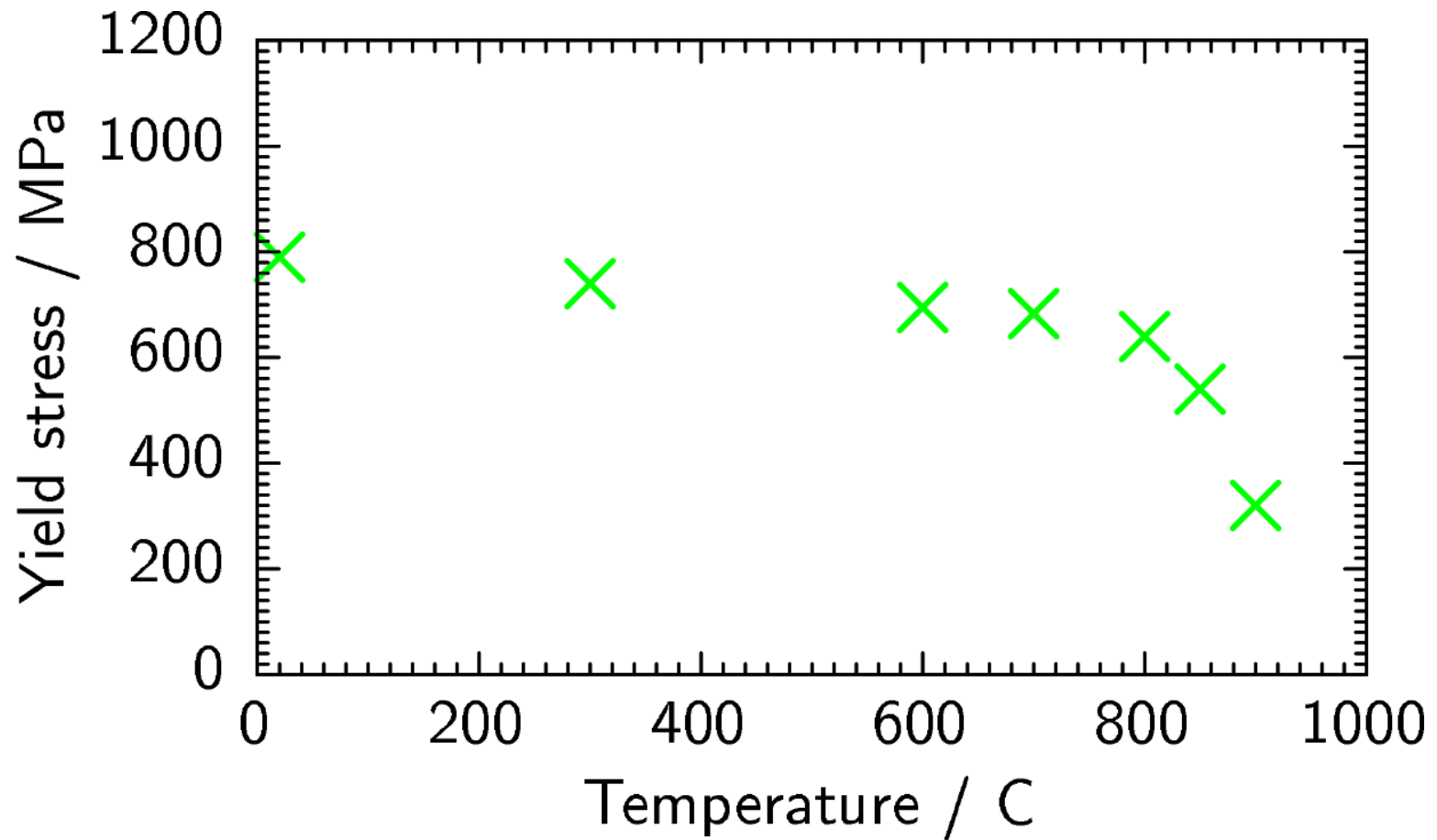
Ni disc alloy



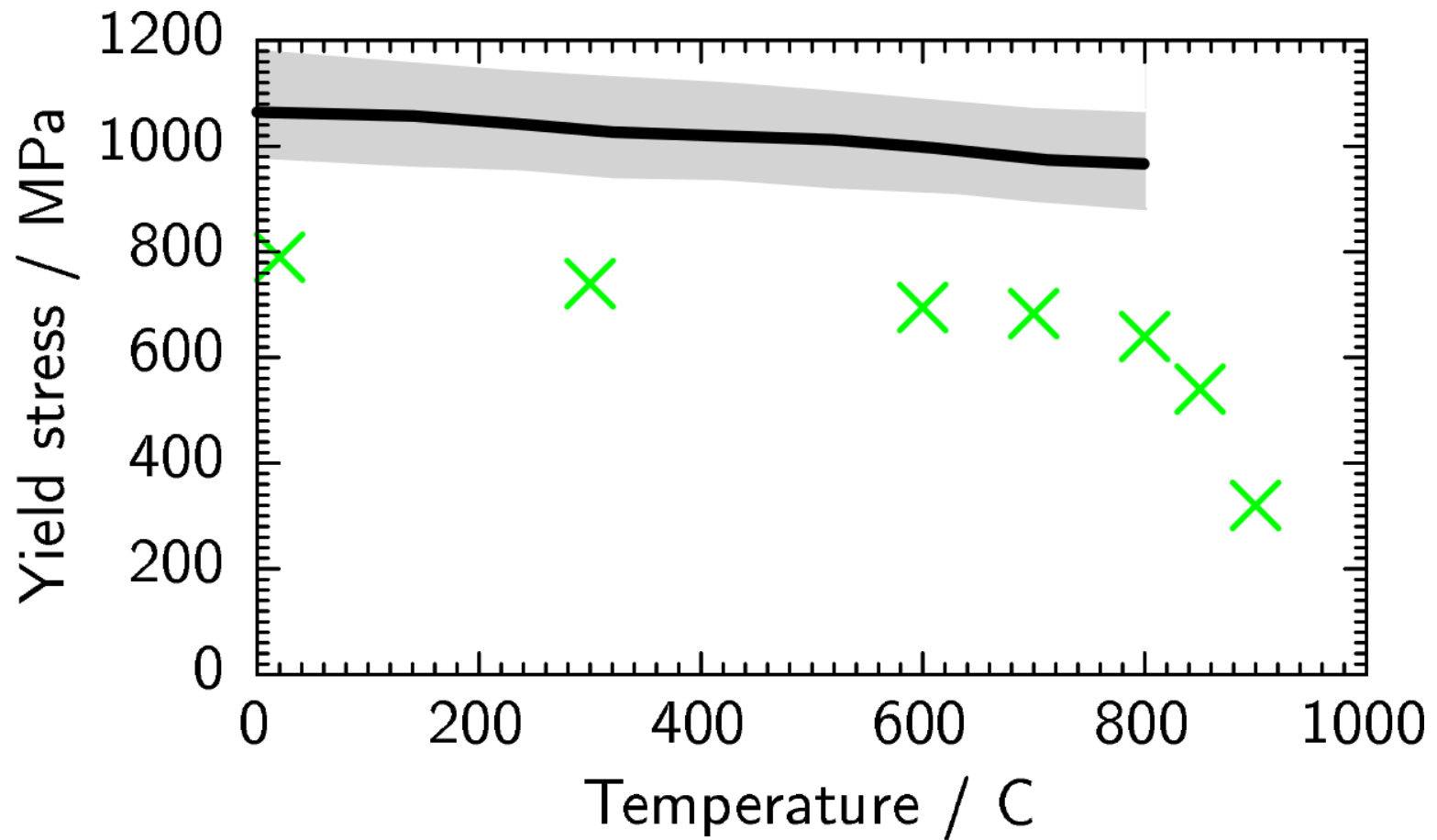
Y

Y'

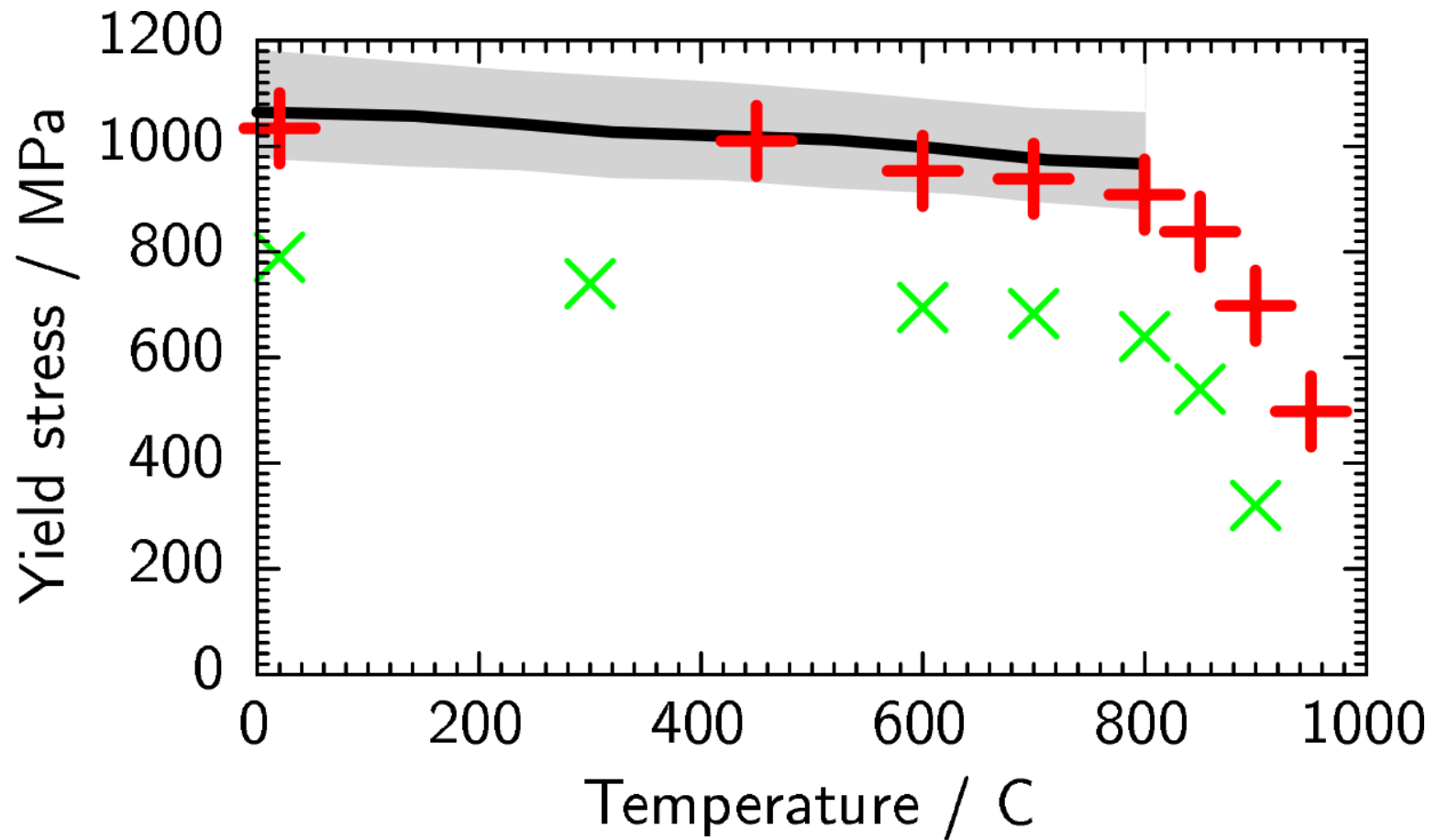
# Yield stress



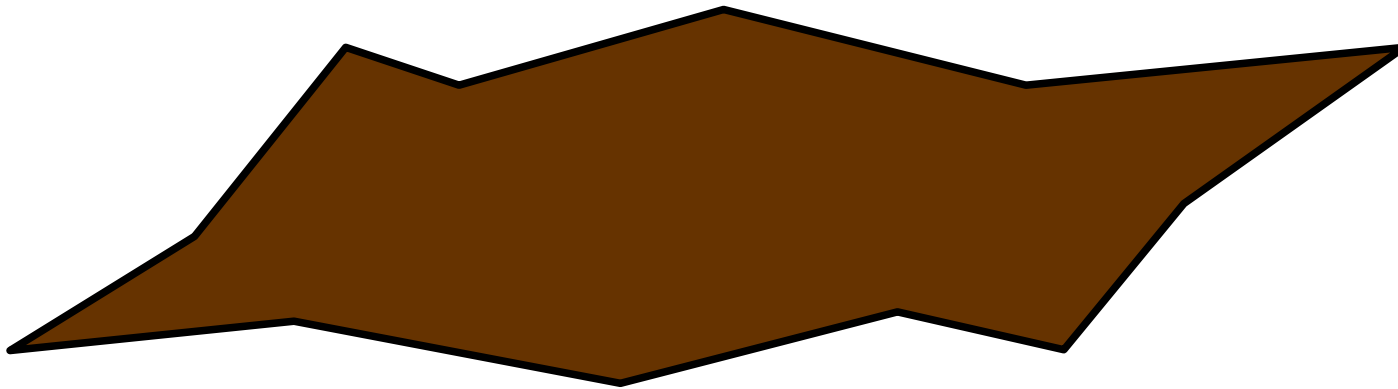
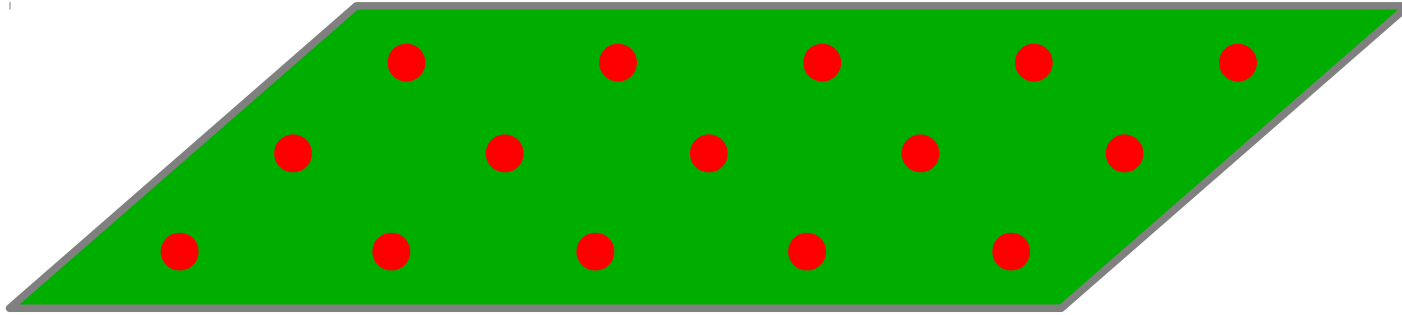
# Yield stress



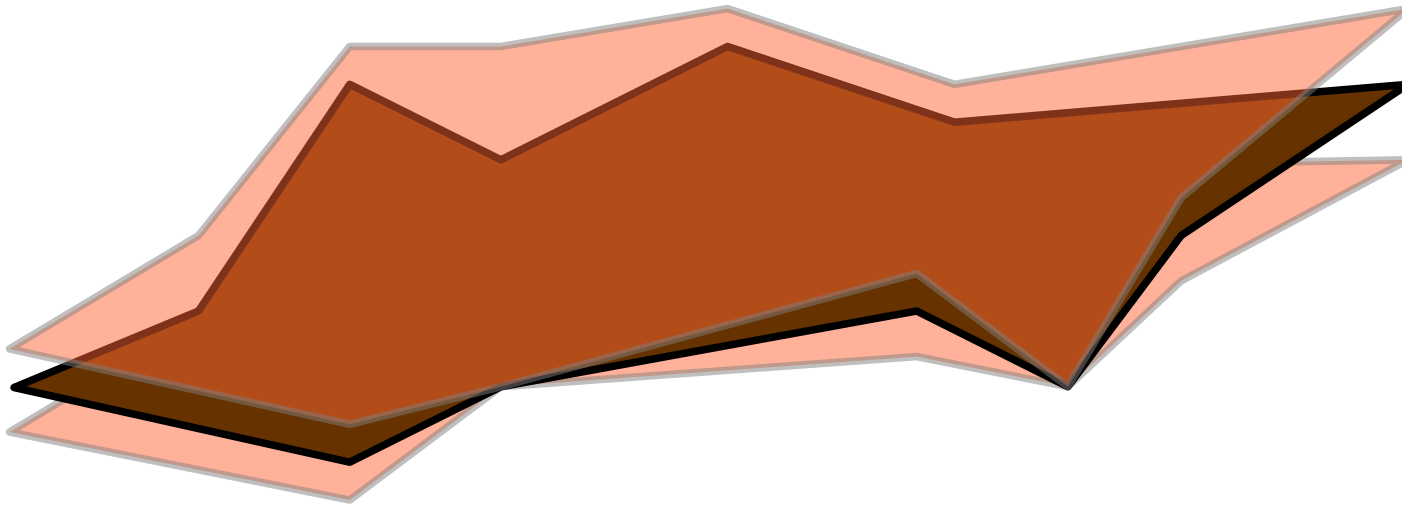
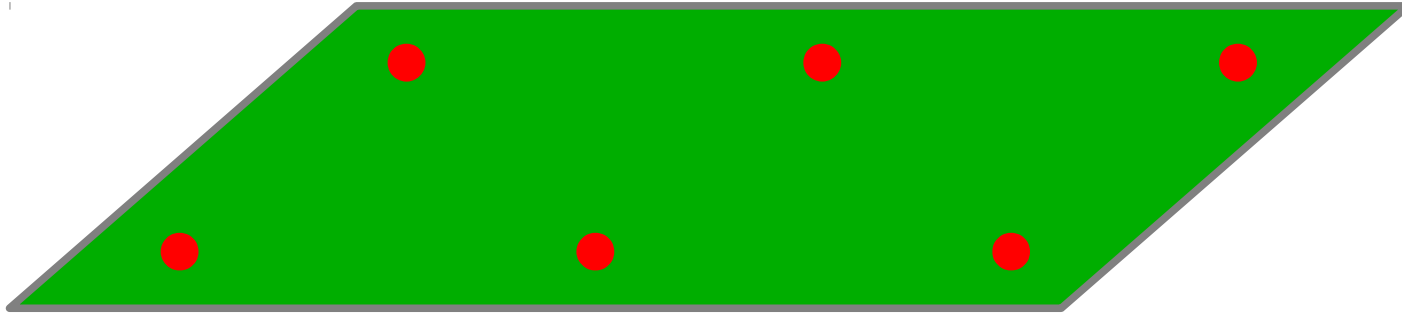
# Yield stress



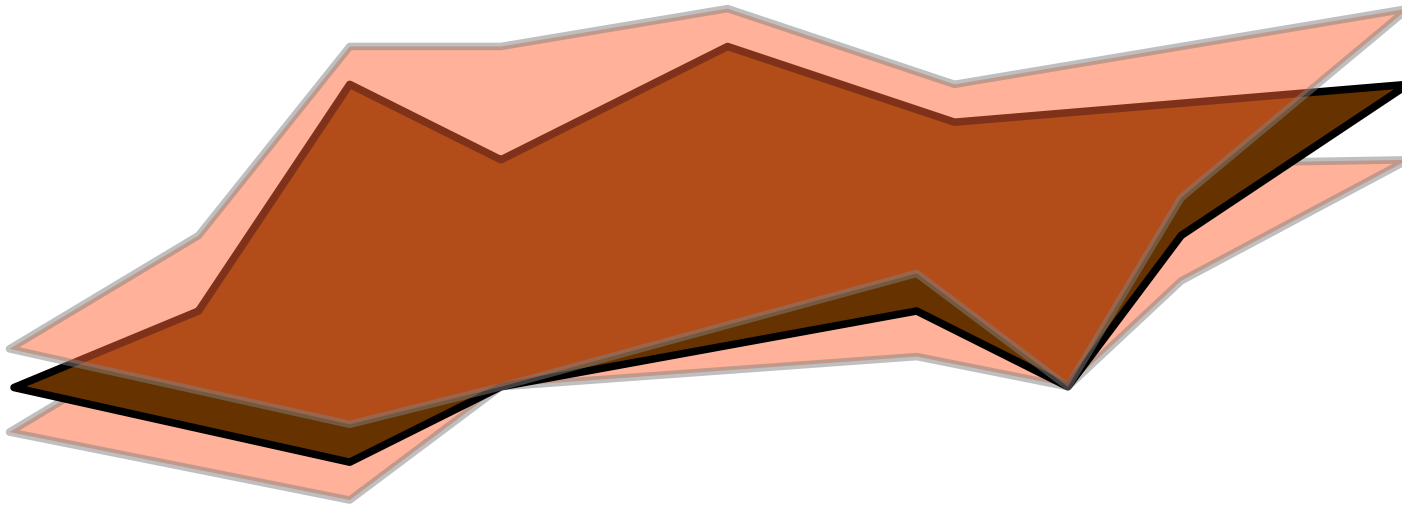
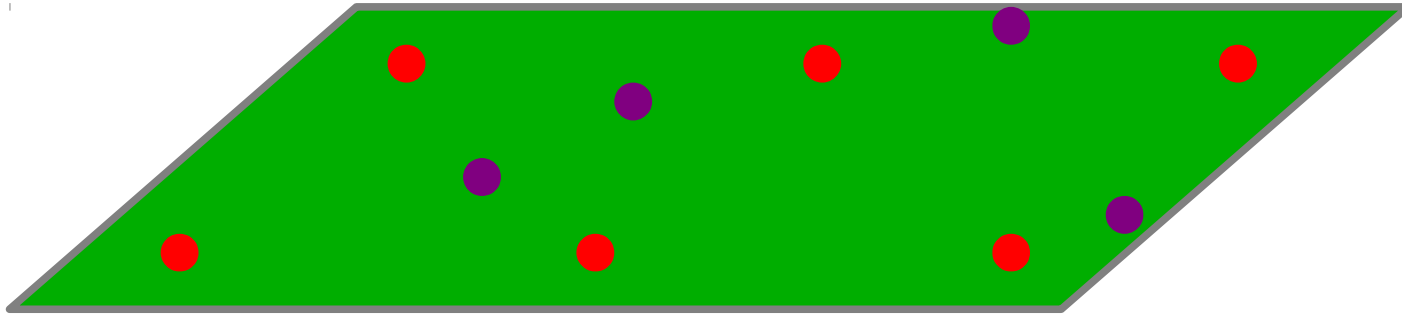
# Iterative sampling



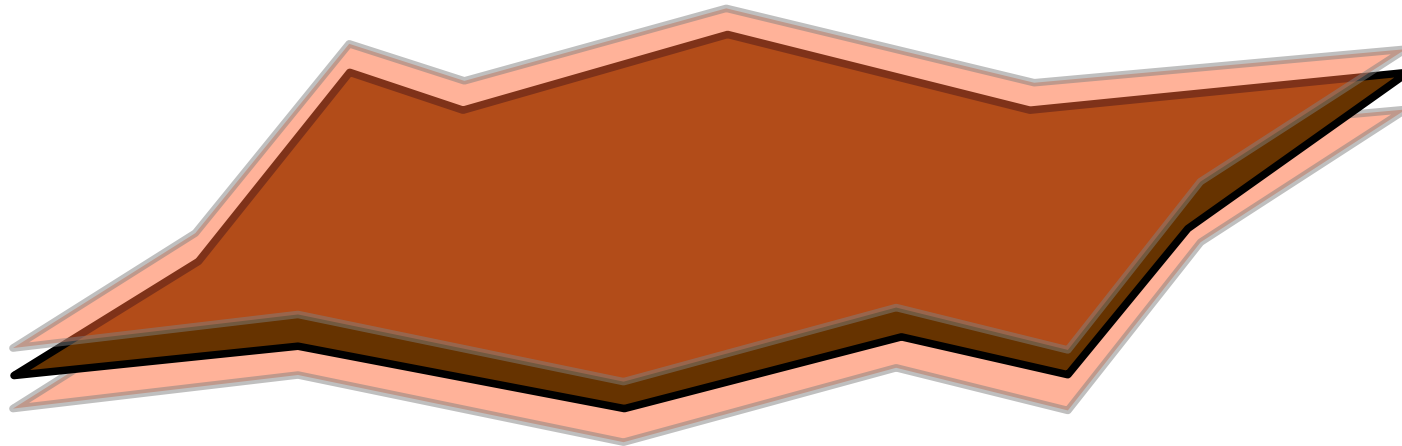
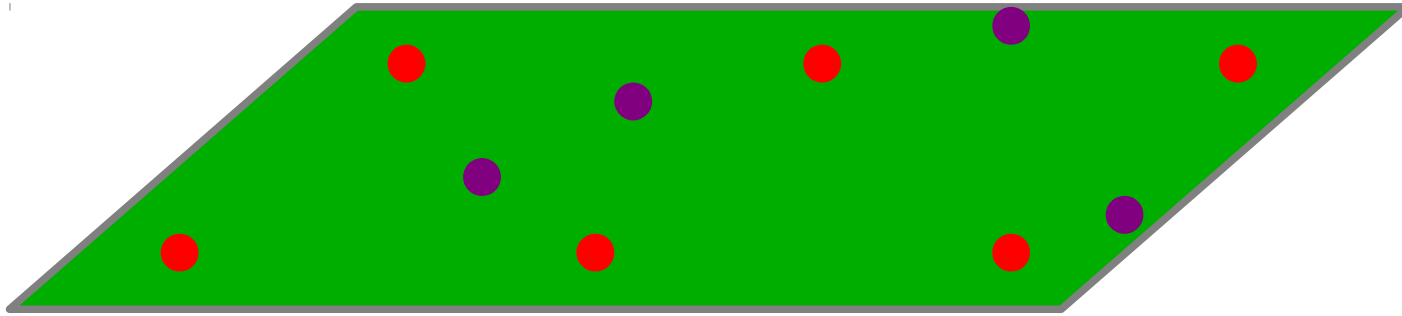
# Iterative sampling



# Iterative sampling



# Iterative sampling





# Iterative sampling

