UNIVERSITY OF CAMBRIDGE

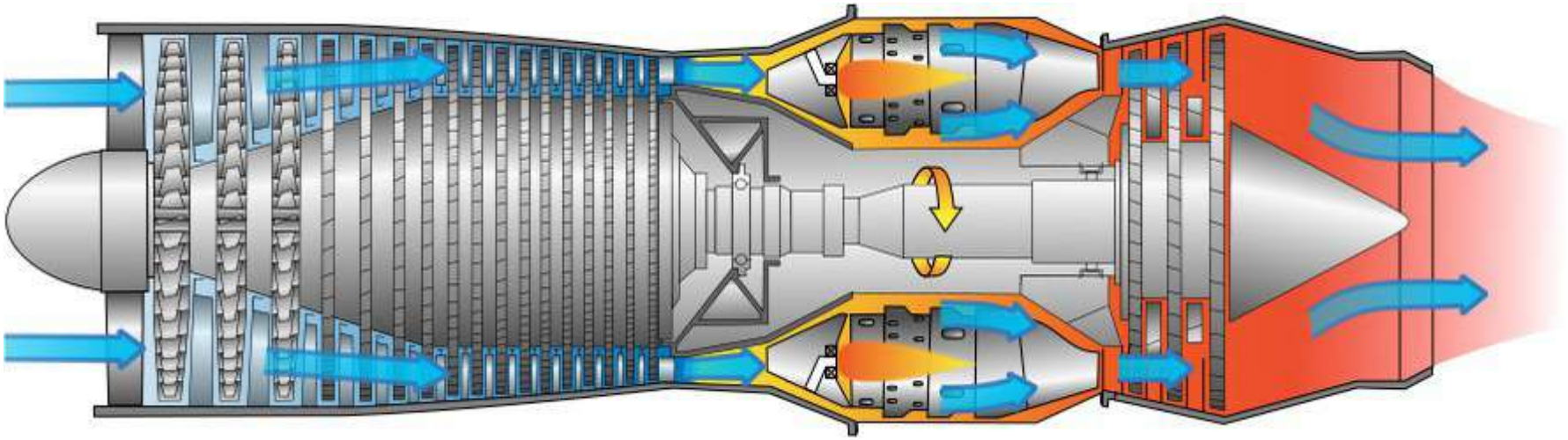
Concurrent materials design

Gareth Conduit

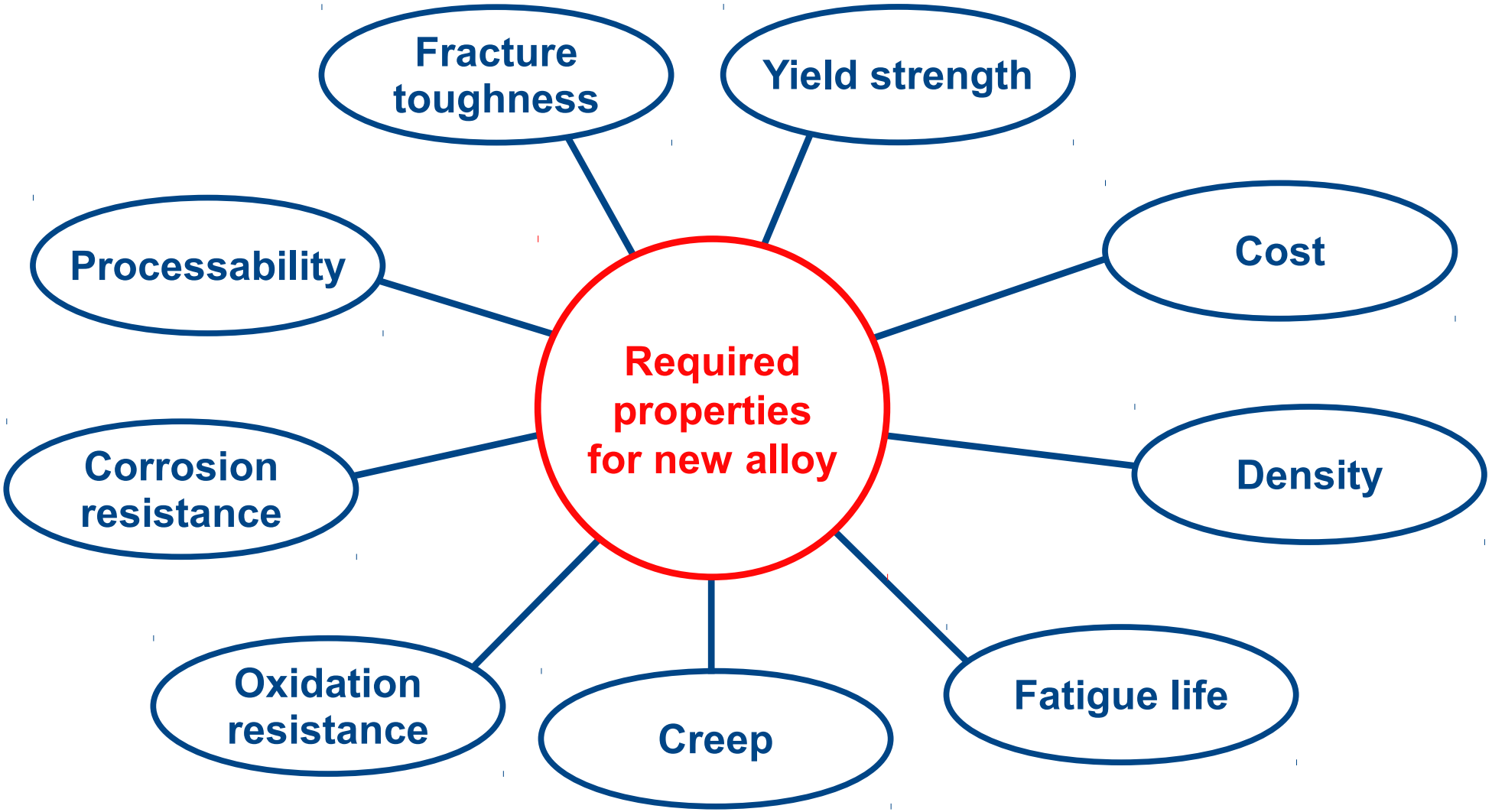
Patents GB1302743.8 (2013), EP14153898.3 (2014), US 2014/177578 (2014)
Patents GB1307533.8 (2013), EP14161255.6 (2014), US 2014/223465 (2014)
Patent GB1307535.3 (2013)
Patent US 2013/0052077 A1 (2013)
Acta Materialia, **61**, 3378 (2013)
Intermetallics, **48**, 62 (2014)

Theory of Condensed Matter Group, Department of Physics

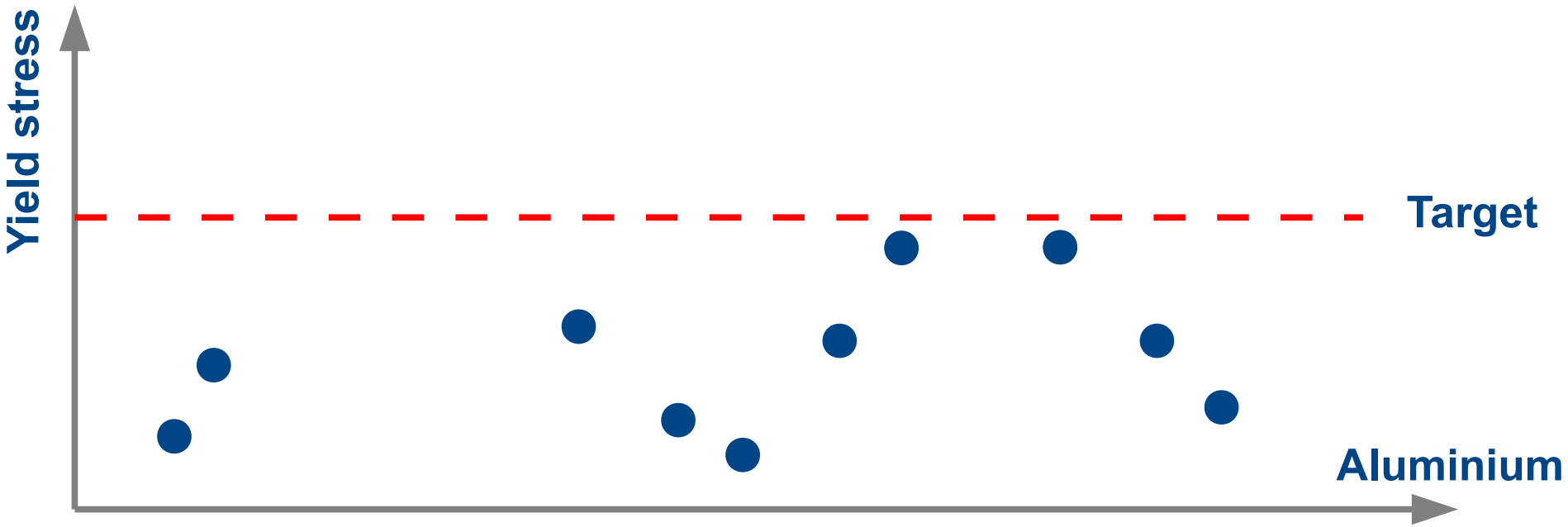
Jet engine: turbine discs



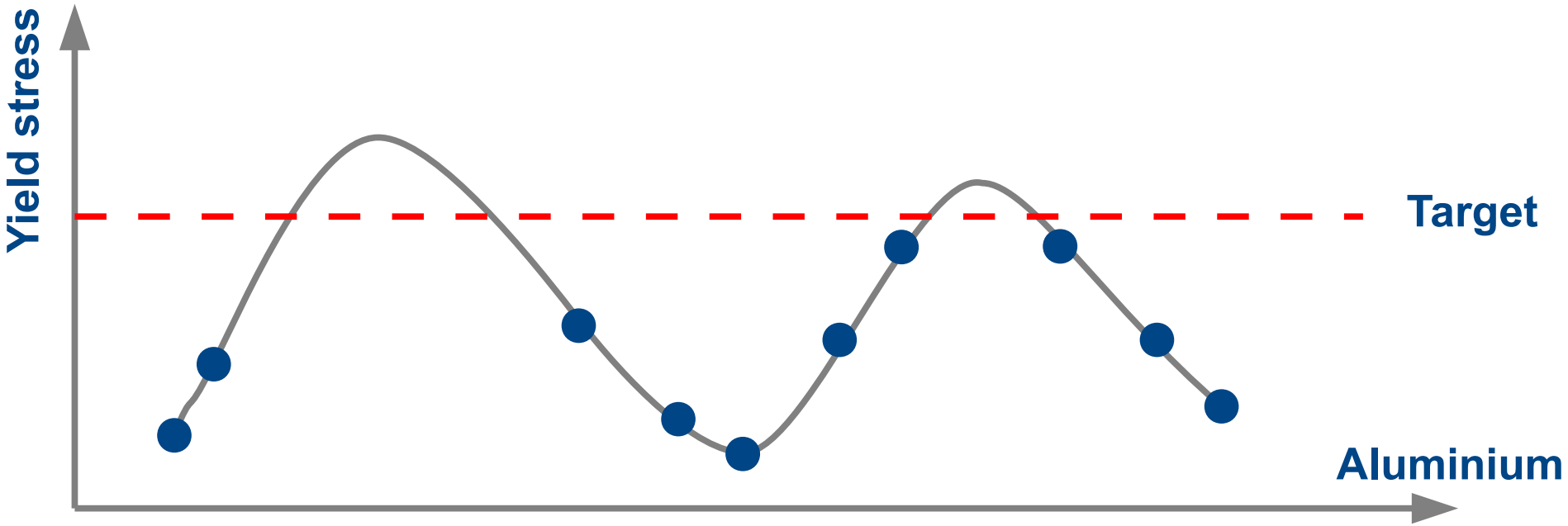
Designing a new alloy – what is required?



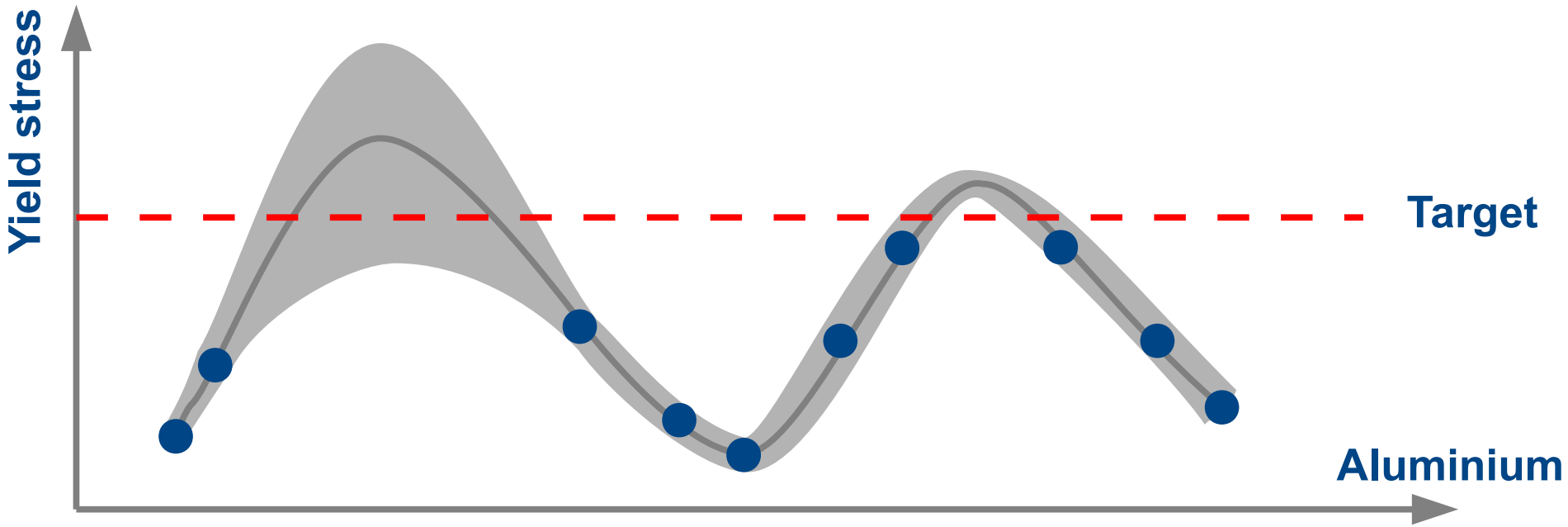
Neural network fitting & optimization



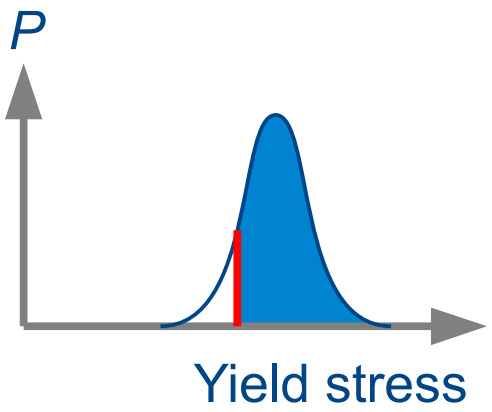
Neural network fitting & optimization

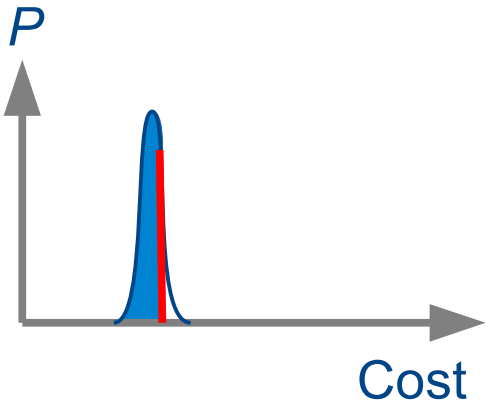


Neural network fitting & optimization

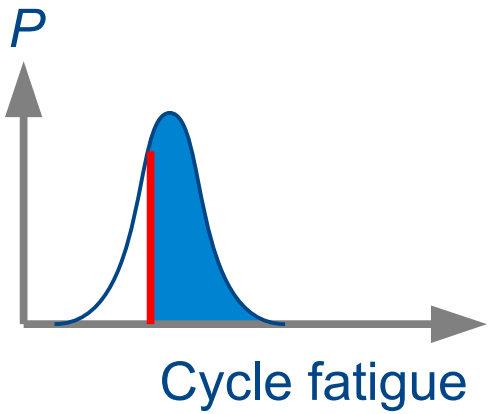


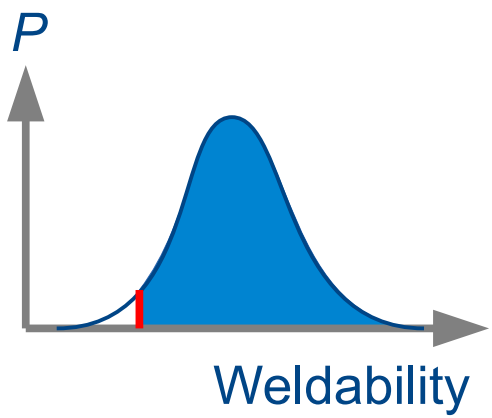
Probability





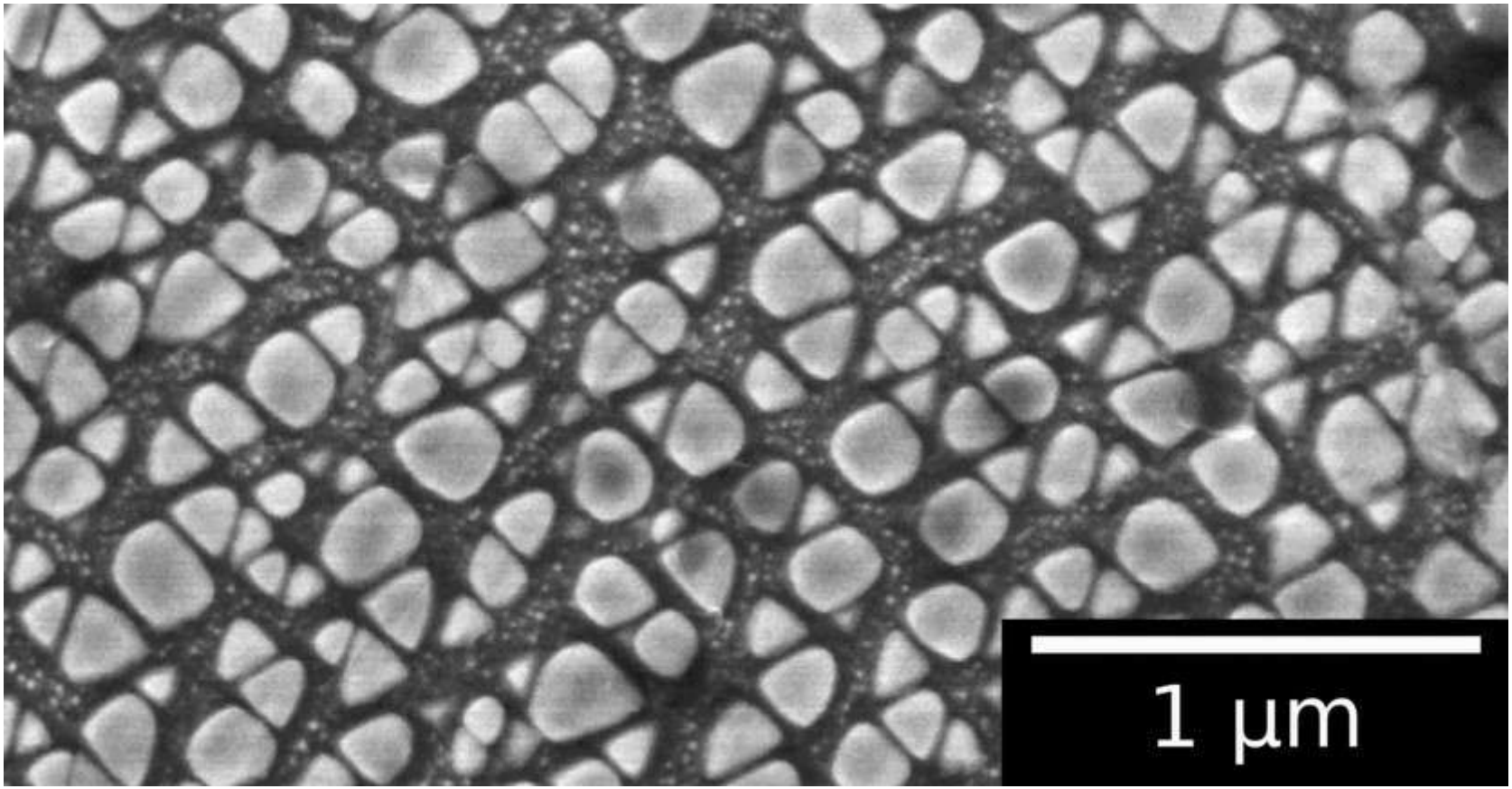
Probability of
alloy satisfying
all properties





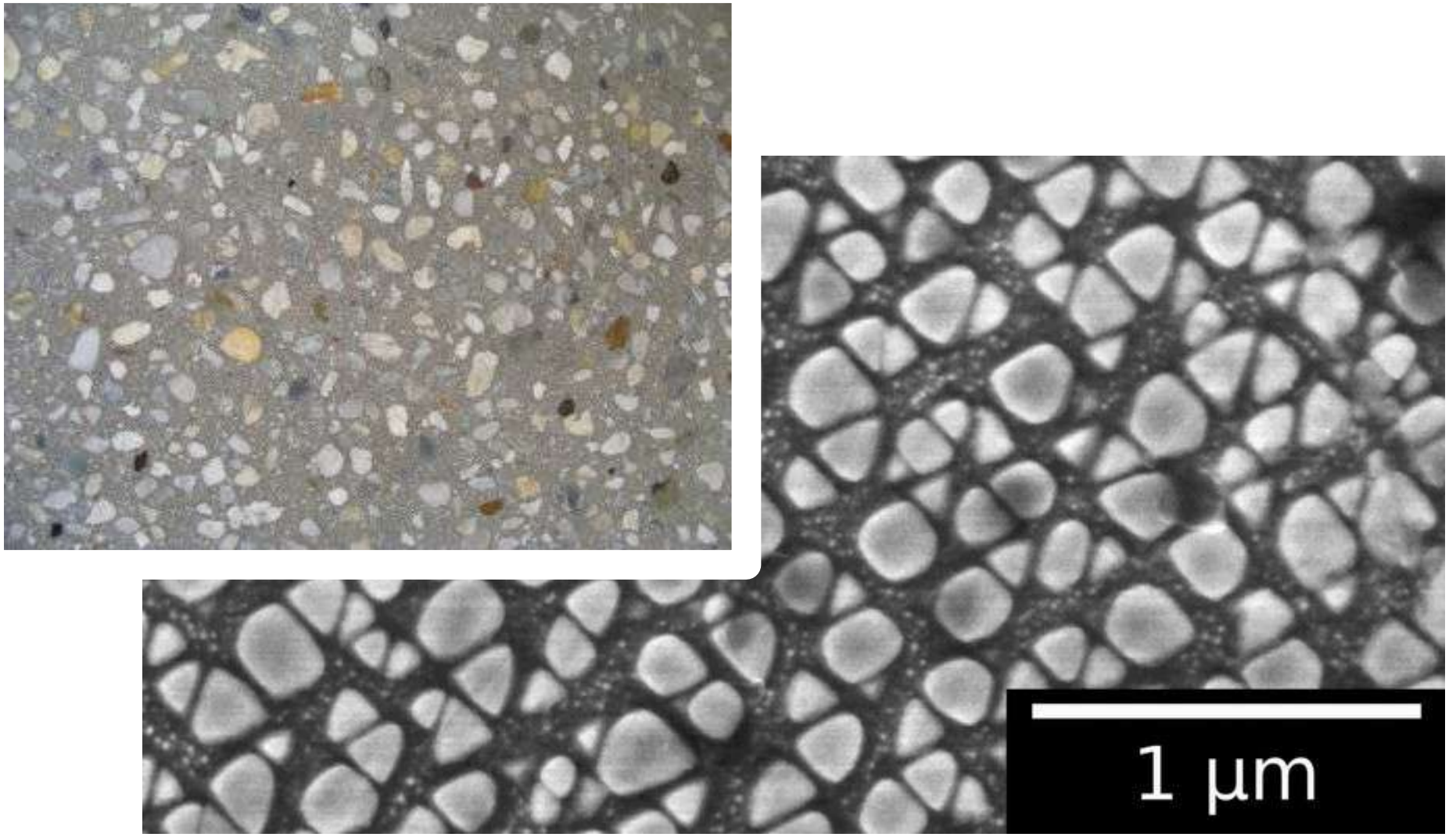
Patent pending GB1302743.8 (2013), EP14153898.3 (2014), US 2014/177578 (2014)

Ni-base superalloy



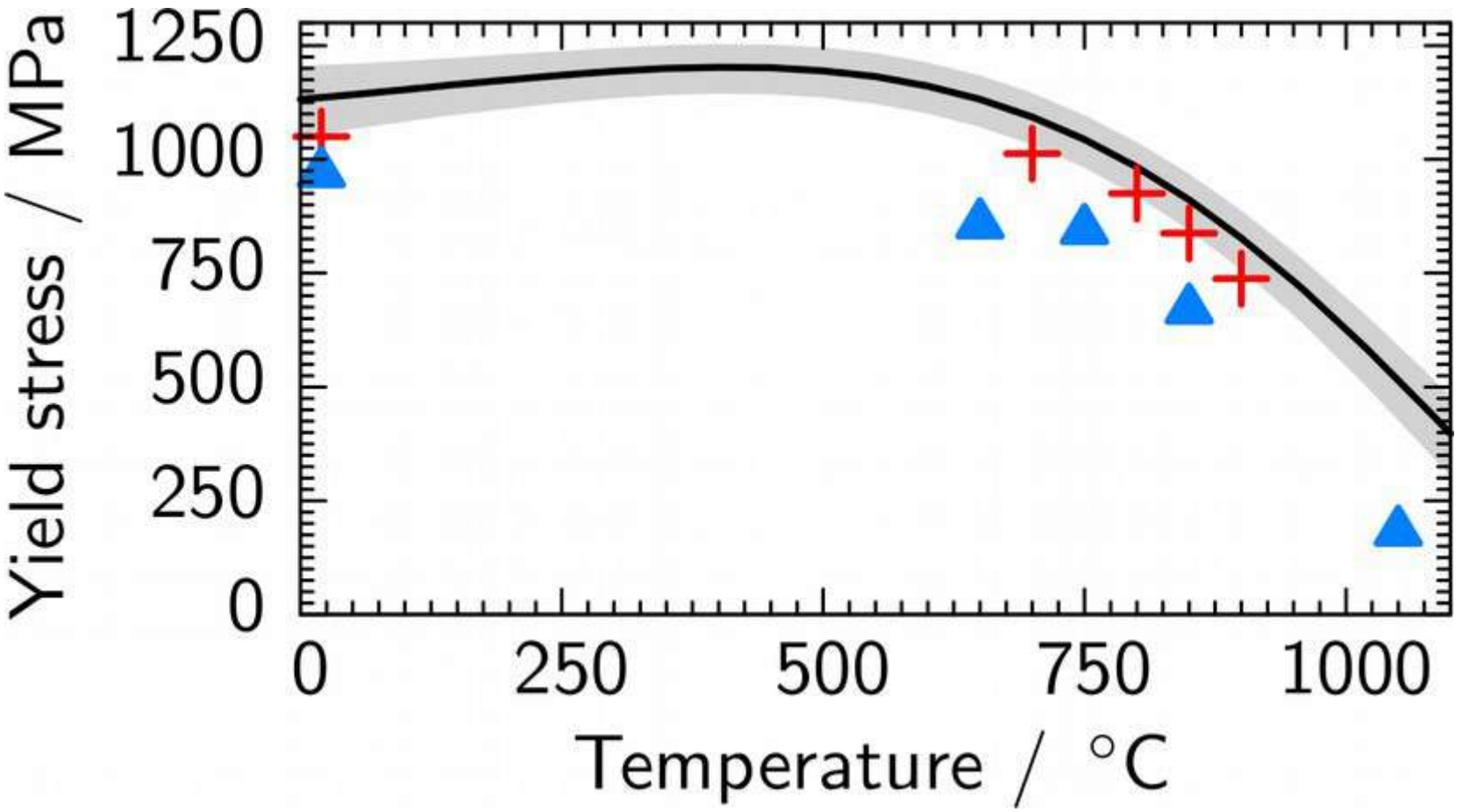
Amendment to patent US 2013/0052077 A1 (2013)

Ni-base superalloy



Amendment to patent US 2013/0052077 A1 (2013)

Ni-base superalloy



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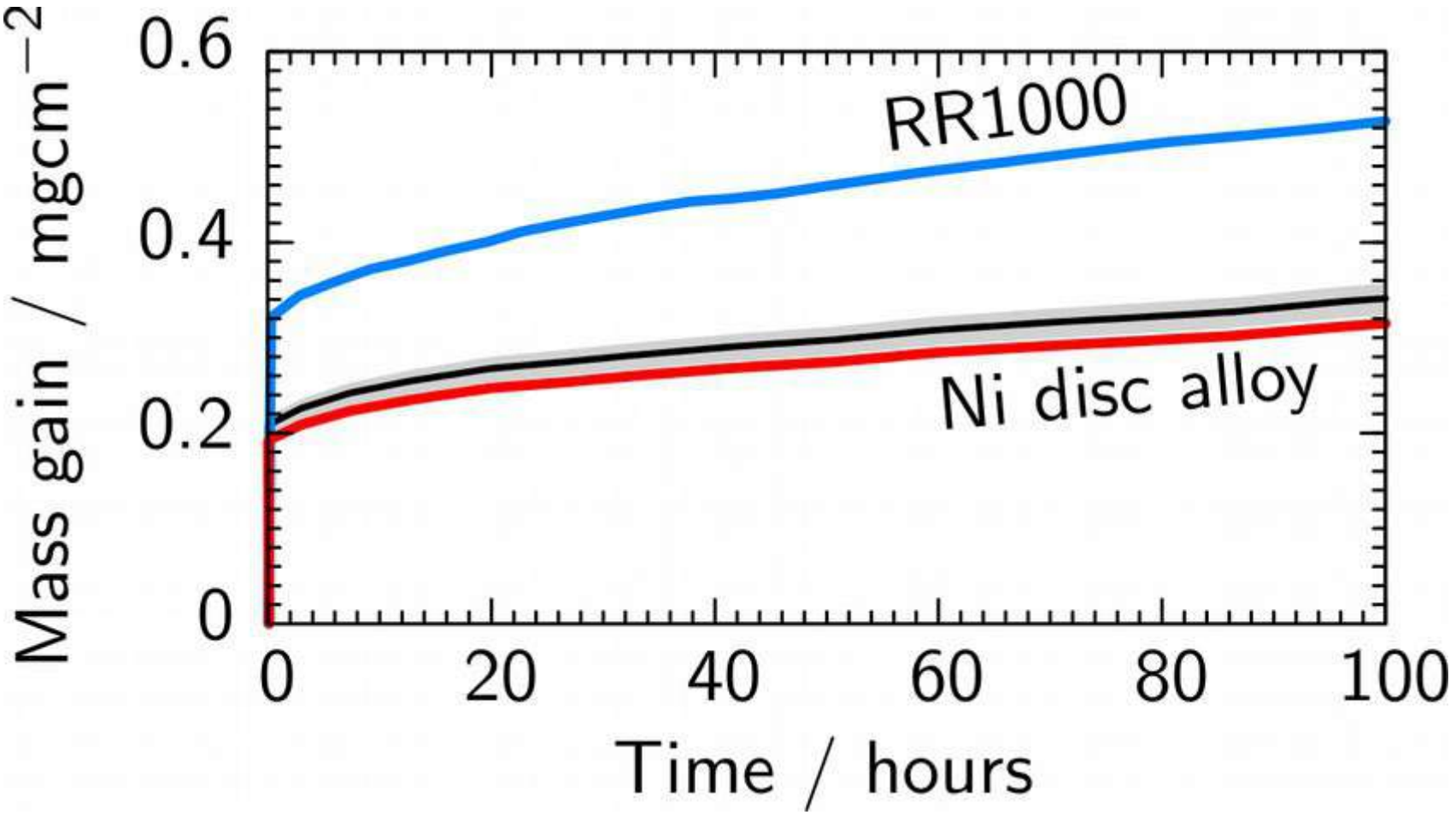
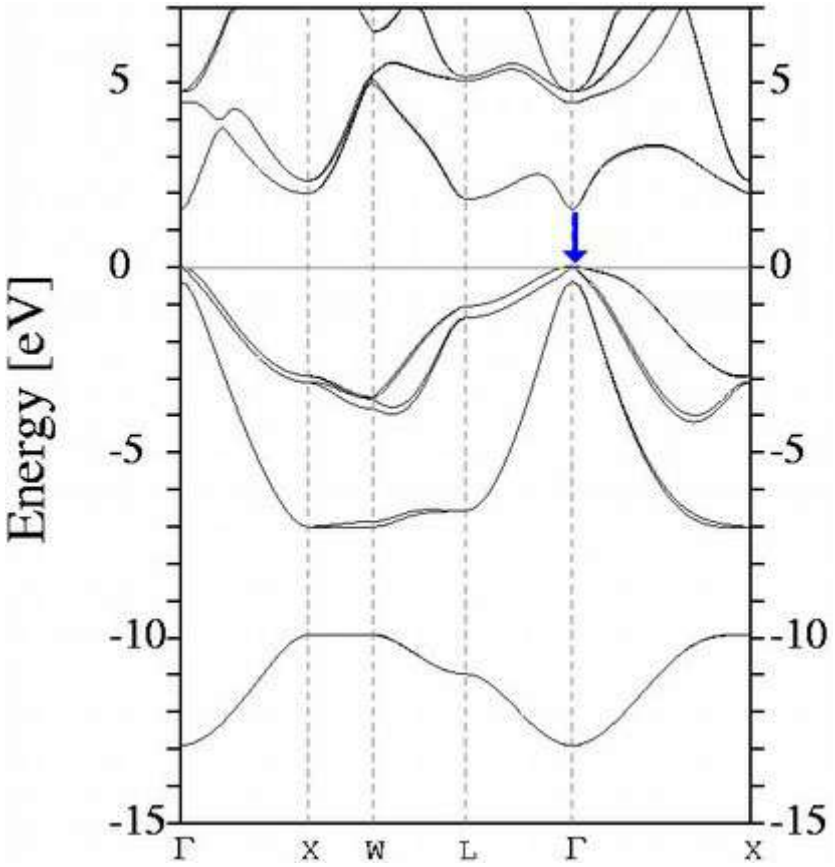


Amendment to patent US 2013/0052077 A1 (2013)

Semiconductors

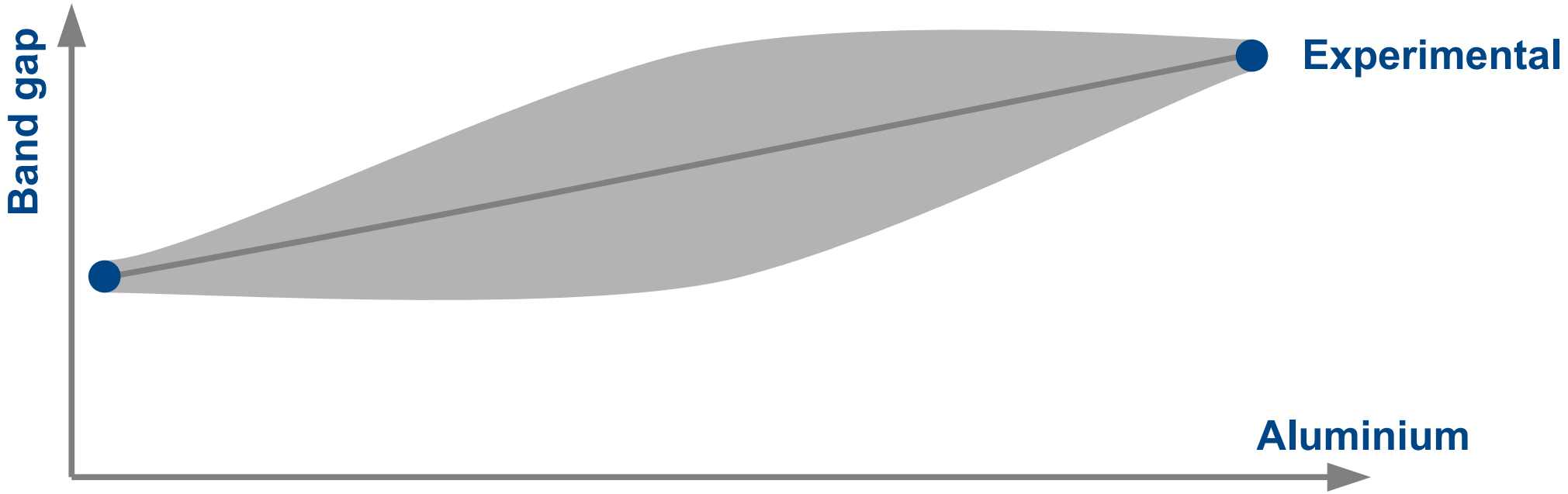


100 points for band gap, efficacy

Property correlations

Band structure: band gap, density of states, effective mass

Semiconductors



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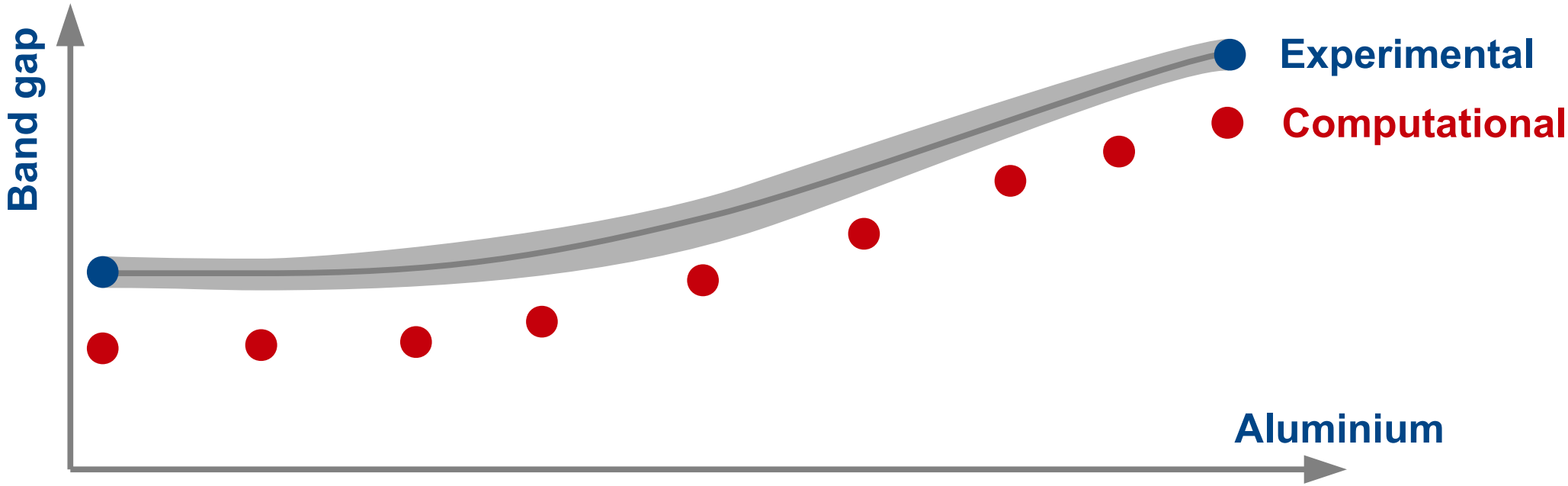


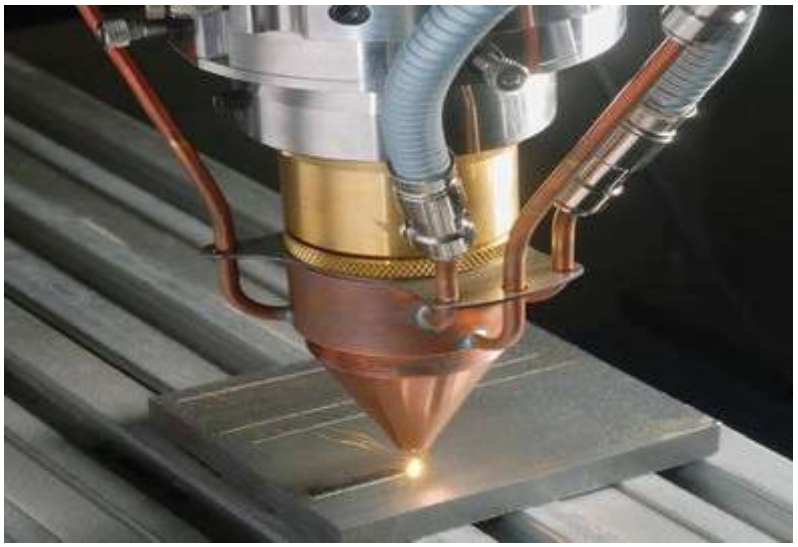
100 points for band gap, efficacy

Property correlations

Band structure: band gap, density of states, effective mass

Correlations between properties

Alloy for
direct laser deposition



7 points for
quality of deposition

Property
correlations

Weldability, thermal conductivity, thermal expansivity, precipitate fraction

Prospects in the future

Take advantage of experimental databases to develop Ni and Mo-based alloys

Combine further first principles approaches to build new databases and guide extrapolation

Projects with Rolls Royce, Samsung, Royal Society Brian Mercer Feasibility award

Long-term goal of concurrent materials design