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Ductile tungsten (W) pipes for structural applications

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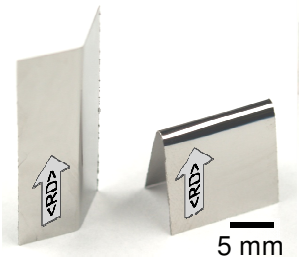
Introduction

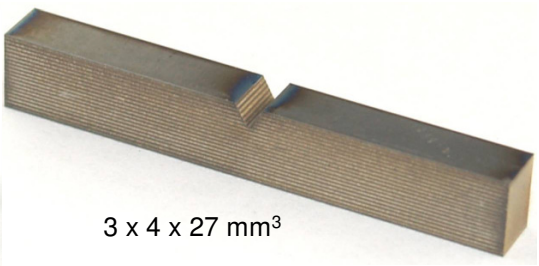
Tungsten, the metal with the highest meting point, has many advantages such as high temperature strength, high creep resistance and a high thermal conductivity. This makes tungsten a premium candidate for high temperature applications like e.g. in fusion energy. The disadvantage of tungsten however is its inherent brittleness. This rises the following questions: How can we make tungsten ductile? And how can we then fabricate ductile tungsten pipes for structural applications?

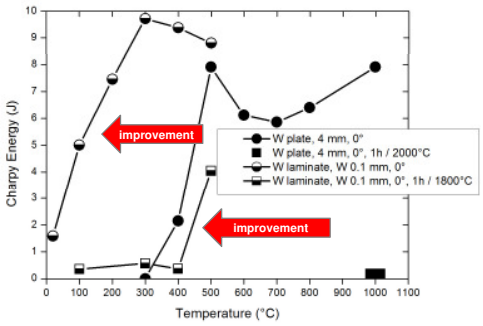
W laminate

W foil is ductile



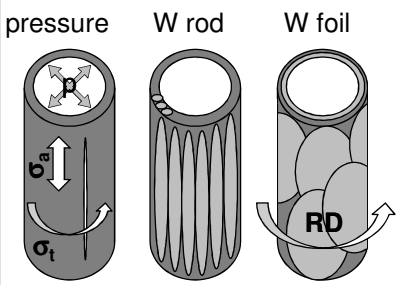
Charpy test sample of a W laminate

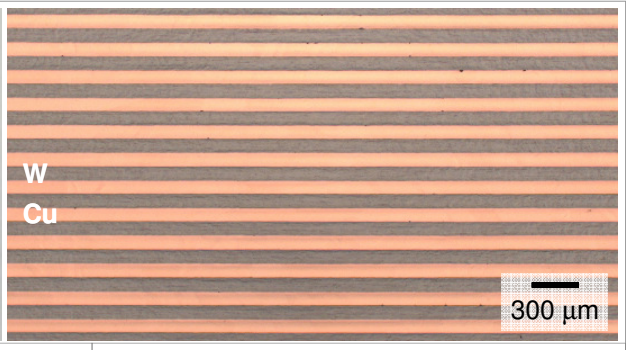




W pipe made of W foil

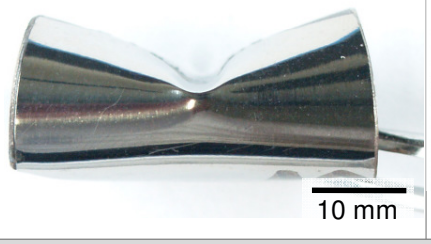
How to make a W pipe?



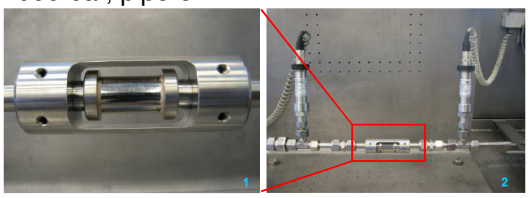


Charpy impact test at 300°C
W rod: 0 J

W foil: 20 J



Internal pressure test at RT
1000 bar, pipe o.k.



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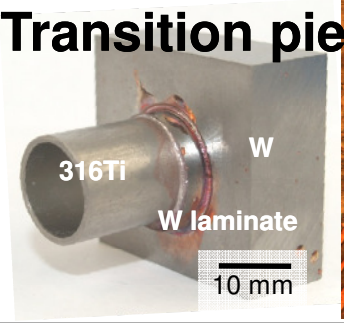
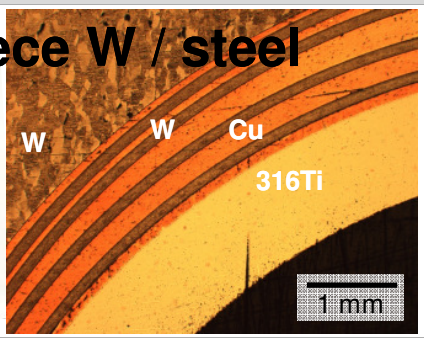
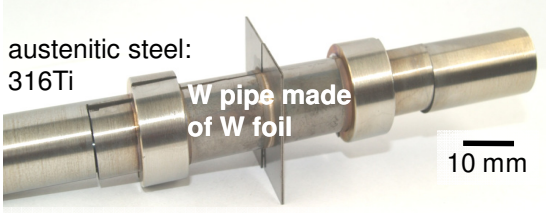
Mockups

Transition piece W / steel





W lamellar monoblock



Structural W material

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