**1. Alfonso et al. - Thermal Stability of a Highly Deformed Warm-Rolled Tungsten Plate​(aflfonso\_jensen \_luo\_pe…)**

* **Main Conclusions**:
  + Two stages of recovery and recrystallization are observed and characterized using well-established models.
  + Large plastic deformations, such as the 90% thickness reduction applied to the tungsten plate, are suitable only for low-temperature applications (up to 900°C for a 2-year lifespan), as higher temperatures lead to rapid degradation of the material.
  + Activation energy for recrystallization is lower for highly deformed tungsten, linked to grain boundary diffusion.
* **Processing Method**: Warm-rolled to a 90% thickness reduction.
* **Temperatures**: Experiments were conducted between 1100°C and 1250°C.

**2. Alfonso et al. - Recrystallization Kinetics of Warm-Rolled Tungsten​(alfonso\_et\_al\_recrystal…)**

* **Main Conclusions**:
  + Recrystallization kinetics were found to be sufficient for operation below 1075°C.
  + Tungsten plate subjected to 67% thickness reduction exhibited stable properties, showing that less severe deformation provides greater thermal stability.
  + Mechanical strength and thermal stability degrade when exposed to high heat, leading to increased embrittlement.
* **Processing Method**: Warm-rolled to 67% thickness reduction.
* **Temperatures**: Experiments were conducted between 1150°C and 1350°C.

**3. Ciucani et al. - Recovery and Recrystallization of Thin Tungsten Plates​(ciucani\_et\_al\_Recovery …)**

* **Main Conclusions**:
  + Recrystallization kinetics depend on the plate thickness and the degree of plastic deformation.
  + Activation energies for recrystallization were found to be lower than expected, suggesting persistent nucleation during annealing.
  + The material is suitable for plasma-facing applications but requires optimization to avoid degradation under high heat fluxes.
* **Processing Method**: Thin plates achieved through warm and cold rolling.
* **Temperatures**: Experiments were conducted between 1325°C and 1400°C.

**4. Minissale et al. - Laser Annealing for Recrystallization Studies​(minissale\_et\_al\_a\_high\_…)**

* **Main Conclusions**:
  + The laser heating facility demonstrated excellent control over recrystallization studies, achieving temperatures up to 2000°C.
  + Annealing experiments revealed significant recrystallization behavior at high temperatures, contributing to material degradation.
* **Processing Method**: Laser-based annealing.
* **Temperatures**: Tests reached temperatures above 2000°C.

**5. Richou et al. - Recrystallization at High Temperature for ITER Tungsten Materials​(RICHOU~1)**

* **Main Conclusions**:
  + Two tungsten materials complying with ITER specifications showed significant recrystallization fractions (50%) at 1600°C and 1800°C, depending on the batch.
  + The study provides critical data for predicting the lifespan of ITER materials under high-temperature operation.
* **Processing Method**: Tungsten monoblocks for divertor components.
* **Temperatures**: Recrystallization fractions were analyzed at 1600°C and 1800°C.

**6. Shah et al. - Recrystallization Behavior of Hydrogen Plasma-Exposed Tungsten​(shah\_et\_al\_recystilliza…)**

* **Main Conclusions**:
  + Hydrogen plasma exposure had an insignificant influence on the recrystallization kinetics of tungsten, which remained governed by the same activation energies as in traditional oven annealing.
  + Recrystallization was identified as a critical process affecting the mechanical strength and embrittlement of tungsten during plasma exposure.
* **Processing Method**: Exposure to high-flux hydrogen plasma.
* **Temperatures**: The study does not specify precise experimental temperatures, focusing on plasma exposure effects.

Let me know if you need further details on any of these papers!

4o

**You said:**

please do the same for these papers as well:

**ChatGPT said:**

ChatGPT

Here is the analysis of the additional papers you uploaded:

**1. Wang et al. - Effects of Thickness Reduction on Recrystallization Process of Warm-Rolled Pure Tungsten Plates at 1350°C​(WANG\_E~1)**

* **Main Conclusions**:
  + The recrystallization process accelerates with higher thickness reduction, leading to smaller grains with a reduced aspect ratio.
  + The Johnson-Mehl-Avrami-Kolmogorov (JMAK) model effectively describes the hardness degradation during heat treatment.
  + Tungsten plates with larger thickness reduction undergo recrystallization more rapidly, resulting in a more uniform grain structure.
* **Processing Method**: Warm-rolled tungsten plates, varying thickness reductions.
* **Temperatures**: Isothermal annealing at 1350°C.

**2. Yu et al. - Hardness Loss and Microstructure Evolution of 90% Hot-Rolled Pure Tungsten at 1200-1350°C​(yu\_et\_al\_hardness\_loss\_…)**

* **Main Conclusions**:
  + The hardness evolution during annealing is divided into recovery and recrystallization stages, with grain boundary diffusion as the key process during recrystallization.
  + Recrystallization is significantly influenced by temperature, with lower annealing temperatures resulting in larger recrystallized grain sizes.
* **Processing Method**: Hot-rolled tungsten with 90% thickness reduction.
* **Temperatures**: Experiments conducted between 1200°C and 1350°C.

**3. Zan et al. - Recrystallization Kinetics of 50% Hot-Rolled 2% Y2O3 Dispersed Tungsten​(zan\_et\_al\_recrsytilliza…)**

* **Main Conclusions**:
  + The addition of Y2O3 particles to tungsten retards the recrystallization process, with particle size and distribution significantly influencing the kinetics.
  + The recovery and recrystallization process can be described using the JMAK model, with larger particles accelerating recrystallization via particle-stimulated nucleation.
* **Processing Method**: Hot-rolled tungsten plates with 50% thickness reduction, incorporating Y2O3 particles.
* **Temperatures**: Isothermal annealing between 1250°C and 1350°C.