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Manufacturing of polycrystalline nickel-based superalloy membranes by directional coarsening through rolling and ageing

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By coarsening of the precipitation phase, bicontinuous γ/γ' networks can be formed in nickel-based superalloys. Either the matrix or precipitate phase is then dissolved by (electro)chemical extraction to receive a γ' - or γ -membrane. Previous studies show that in single-crystalline CMSX-4, both rafting and pure thermal ageing result in complete interconnection of the respective phases. This creates directional and non-directional structures from which γ - or γ' -membranes can be produced, depending on the extraction process. Recent publications investigate the development of superalloy membranes made from a polycrystalline nickel-based alloy by incoherent growth of precipitation particles. Good mechanical properties are achieved by the production of γ -membranes.

In this work, we show polycrystalline membranes with a directionally coarsened structure. With the help of separate mechanical and thermal treatment, a rafted structure similar to the directionally coarsened one in CMSX-4 is also formed in the polycrystalline alloy. In contrast to the uniaxial creep load during the production of directionally coarsened single-crystalline membranes, a directional rafted structure is formed here from originally cubic γ' precipitates by repeated rolling and ageing.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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