Challenges for the design of Ni-based SX superalloys components

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Increasing the operating temperatures is the most reliable way to improve gas turbine efficiency of aero-engines and industrial gas turbines. A dramatic temperature increase has been obtained in the last four decades by adjusting chemical compositions of cast Ni-based superalloys and by using specific processing routes (e.g. directional solidification). However, despite the recent developments of the 5th and 6th generation of Ni-based SX superalloys, it seems that the expected gain in operating temperature by adjusting the chemistry are rather limited.
In this presentation, a special focus will be paid to the improvements still possible in mechanical properties associated to the processing conditions of Ni-based SX superalloys. An overview of their performances under aero-engine certification conditions will also be proposed in addition to the way lifing methodologis need to be improved to reproduce accurately the creep elongation and creep life under such conditions.