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Optimisation Procedure of the NiAl Combustion Synthesis under High Gas Pressure in Repairing Ni-based Superalloys

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The "SHS build-up process" under high gas pressure was previously reported by the authors. In this process, a Ni-based braze is inserted between a substrate of Ni-based superalloy and a reactant compact made of 50 at.%Ni-50 at.%Al mixture. The heat released during the combustion synthesis of the Ni+Al compact gives rise to interdiffusion of the elements and consequently to a joining interface. In this paper, we focus on the experimental conditions. Selection and optimisation of the experimental parameters are reported. Five experimental parameters are to be defined: the gas pressure, the heating rate of the reactants, the granulometry of aluminium and nickel powders, their compacting pressure and their weight. The influence of these parameters on the quality of the joining was studied using several values chosen in order to get a complete combustion synthesis.