

The invention concerns a vapour phase chemical infiltration process for densifying porous substrates arranged in annular stacks. The substrates (12) to be densified are loaded into the reaction chamber (11) of an infiltration furnace such that they are arranged in at least one annular stack (30) which delimits an internal passage (31) with spaces (33) between the substrates. On leaving a pre-heating region (18), the gaseous phase introduced into the reaction chamber is directed towards one of the two spaces formed by the interior and exterior of the substrate stack or stacks, preferably the smallest space. This space (31) is closed at its opposite end such that between its introduction into the chamber and discharge therefrom, the gaseous phase circulates from the interior to the exterior of the or each stack or conversely, the gaseous phase passing through the spaces between substrates and being diffused inside the latter.

