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On the mutual penetrations of two gases submitted to the Richtmyer-Meshkov instability: Part 1 - experiments

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An experimental investigation, based on the laser sheet technique, has been undertaken to study the mutual penetrations of two different density gases, the interface of which is submitted to the Richtmyer-Meshkov instability. Two couples of gases are used to illustrate both heavy/light (air/He) and light/heavy (air/SF₆) cases. The incident shock wave Mach number is of about 1.31 and gases on both sides of the interface (a 0.4 μm nitrocellulose membrane) are at atmospheric pressure. Two different perturbations (positive and negative) are tested. Experiments will be compared with numerical simulations obtained from CARBUR code.

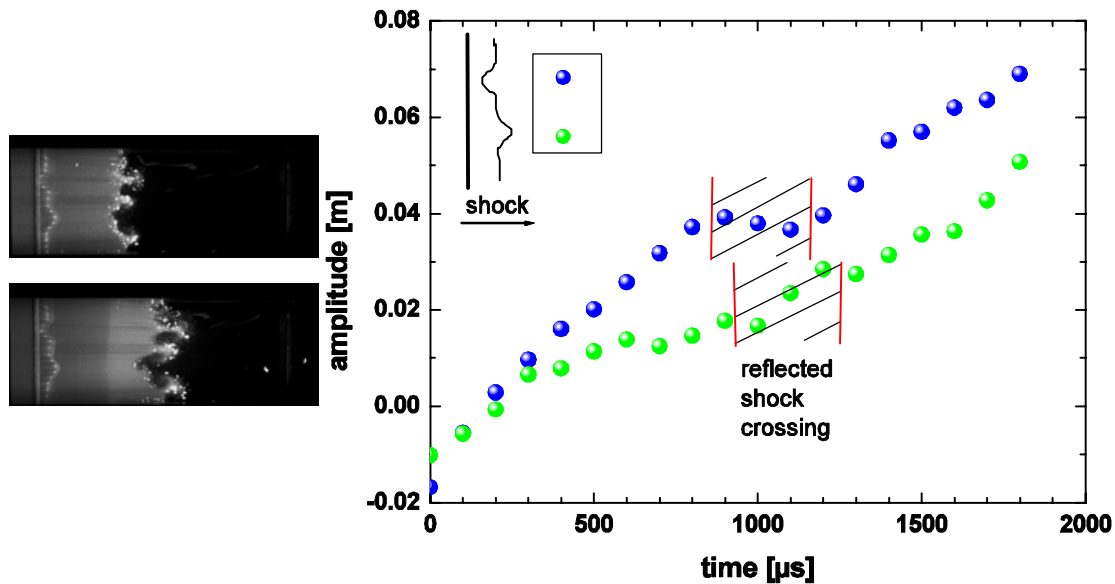


Figure 1: Example of laser sheet typical visualisations of a heavy/light (air/helium) interface submitted to a 1.31 incident shock wave Mach number, moving from left to right first in air (grey) then in helium (black). Frame 0 is taken 22 μs before interaction (100 μs separate two consecutive frames, i.e. 700 μs between frames 0 and 7). The amplitudes and wavelengths of the initial perturbations are $a_0 = 90$ mm and $\lambda = -18$ mm and $a_0 = 80$ mm and $\lambda = 14$ mm, respectively. (b) Evolution of the amplitude of the initial perturbations (the opposite value of the negative perturbation is plotted in order to keep both graphs on the same figure).