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**Analytical Solution for Isentropic Flows in Solids** OLIVIER HEUZE, CEA/DAM/DIF — In 1860, Riemann gave the equations system and the exact solution for the isentropic flows in ideal gases. This solution is based on the hypergeometric function. For monatomic, diatomic or polyatomic gases, the polytropic exponent is $(2n+1)/(2n-1)$ and the solution is obtained through polynoms of degree $n$. We have to notice that, if Riemann uses the polytropic exponent to show the interest in these practical cases, it is more rigorous to use the fundamental derivative, defined by Thompson in 1971, which is an adimensionnal number associated to the convexity of isentropes. Different authors have given further details for this solution: Hadamard (1903), Courant and Friedrichs (1948), Landau and Lifschitz (1959) and Stanyukovitch (1960). But to our knowledge, nothing has been done to apply it for solids. Properties of shock waves in solid materials can often be described by the equation D=c+s u, where D and u are the shock and particle velocities, and c and s properties of the material. We can notice that s is strongly linked to the fundamental derivative. This means that the assumption of constant fundamental derivative is useful for these solids and that we can apply the exact Riemann solution for them. The hypergeometric function remains very complicated in that case, but can be developed in power series which converges very efficiently. Then, if we just change the coefficients of Riemann polynom for polyatomic gases, we obtain a very good approximation for solids.

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