Influence of void coalescence on the spall evolution of ductile polycrystalline metal under dynamic loading

It is well known that nucleation, growth and coalescence of voids are the principal mechanisms of spall fracture in ductile materials under dynamic loading. Obviously, void coalescence in constitutive damage models is an important factor to better describe the spall fracture of ductile materials. In our work, a new void coalescence criterion accounting for the damage and void geometry is developed, based on the geometric relationship between voids. According to the principle of energy conservation, we reveal the physical mechanism explaining the influence of void coalescence on the growth of damage. The comparison between calculated results and experiment data indicates that void coalescence leads to rapid growth of damage, reduction of void numbers and increase of average void size.

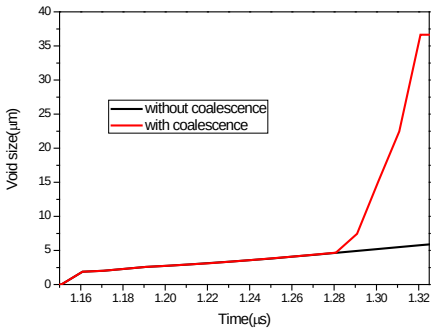

Fig1. Influences of void coalescence on the void size

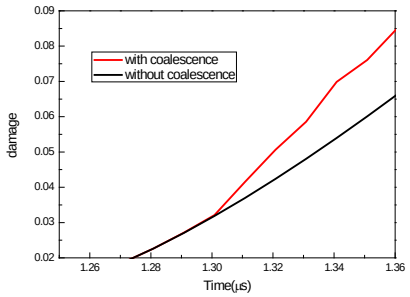

Fig2. Influences of void coalescence on the spall damage

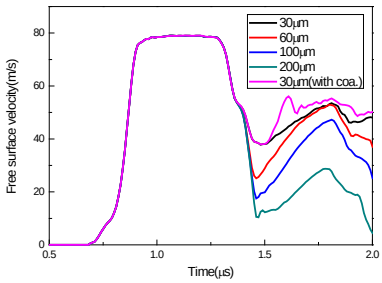

Fig3. Influences of void coalescence and grain size on the free surface velocities（calculation）