

Chapter 6

Other Nuclear Weapons

The atomic bombs mentioned so far are based on the nuclear fission reactions of U-235 or Pu-239. However, other kinds of nuclear weapons have been devised or contemplated. The hydrogen bomb was developed by the United States and the Soviet Union and was tested a number of times, but the projects seem to have been abandoned. It is based on the nuclear fusion reaction (essentially, $4\text{H}^1 \rightarrow \text{He}^4 + 2\text{e}^0$, but more complicated in reality) – that is, the energy source of the sun.

The idea of the neutron bomb has been conceived as a new effective weapon because neutrons penetrate easily into the body, destroy tissues and organs, and also convert most of the stable isotopes in the body into radioactive ones and, hence, kill it. The basic principle of the neutron bomb is the same as for the atomic bomb, so that the blast and heat are unavoidable, but it tries to reduce this portion and increase the proportion of the release of neutrons. Neutrons can penetrate protective materials (armor) or tanks, as well as human bodies. In addition to the United States, the Soviet Union, France, and China have developed weapons based on this principle, but, again, they seem to have abandoned the research eventually (Neutron bomb, Wikipedia).

In the present circumstance, the most serious weapon are the so-called “depleted uranium (DU) munitions”. They do not use the nuclear fission reaction, and, hence, do not generate enormous heat; therefore, they are not a nuclear weapon in the strict sense. The uranium from which U-235 has been extracted (in the U-235 enrichment process) is called “depleted uranium”. It is not “uranium-depleted”. It is still essentially uranium (though mostly U-238), which is an α -emitter. It is quite cheap, as it is a waste product and no longer worthy as a source of fuel. The uranium metal is quite heavy, with a density of 18.95 g/cm^3 , which is comparable to gold with a density of 19.28 g/cm^3 . Also, it is quite hard, so a bomb composed of it can penetrate the body of a tank and may reach an underground bunker. Hence, such a bomb is very effective and, yet, can be produced cheaply. It has been widely used in Iraq, Yugoslavia, etc. Its health effects are very controversial and will be discussed in Sect. 16.4.