Article:

The Verneuil Method, known commercially as “Flame Fusion”, is a very common method of producing synthetic crystals for both industrial and commercial use. The process is typically favored over alternative methods for applications where precision and purity are not requirements. The method has much less strict requirements for production, except for the purity of the feedstock. The process involves using a seed crystal below a nozzle, with the feedstock leading down a funnel onto the seed. The feedstock is turned into plasma or molten fluid and sputtered or dripped onto the seed crystal. This process will slowly build up layers of monocrystalline material over the course of several hours. The resulting crystal often has a cylindrical or teardrop-like form factor. This type of crystal is referred to as “boule”. This method allows very fast production of single crystals, with the downside of optical purity typically being sacrificed. However, resulting material often visually appears optically clear. Because of this, it is often used in the gem industry as a source of facet rough.

Regarding specific materials, corundum and spinel are the most common crystals produced using the Verneuil Method. Doping corundum with various ions or compounds can shift its color to match natural varieties such as ruby and sapphire. Similarly, spinel has many varying colors based on its dopants. Furthermore, there is a far greater range of colors that are available through synthesis than there are in terms of natural finds.

On the industrial scale, Verneuil corundum is grown for use in simpler optics that have lower impurity tolerances. For example, panels for screen protection, viewports in high-temperature environments, scratch resistant lenses and windows (such as watch crystals), bearings, and watch jewels, among many other uses. Other methods may be preferable in certain circumstances, but Verneuil Synthesis has proven to be effective, affordable, and fast.

History:

The original Verneuil Method was first developed and researched by French chemist Auguste Verneuil in late 1883. However, some information has suggested that similar methods were used to produce rubies in Geneva up to 20 years earlier. Some of these rubies were first publicized around 1880 while being sold by an unknown Genevan merchant. These rubies are said to have been part of the inspiration for Verneuil’s own process. He would later publicize his findings in 1902 and explain his process in detail in 1904. Since then, production has grown exponentially. Internationally, China is now the leading producer of Verneuil corundum and spinel. It represents a massive chunk of the gemological industry, even with alternative methods like Czochralski, Hydrothermal, and Flux synthesis. Due to the ease of production, it will likely continue to be the most popular method for synthesis of ruby, sapphire, and spinel.