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Black Powder Stability and Aging Example

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The stability and aging characteristics of Black Powder are occasional topics of discussion. Having been given a research sample of Black Powder that had been recovered from the explosive charge in cannon balls dating to the time of the US Civil War (ca. 1863), the author was able to investigate these issues for that powder sample.

The physical appearance of the Civil War Black Powder is consistent with its still being of high quality. The powder is unglazed (or minimally glazed); the grains are hard and show no visible signs of physical deterioration. The powder is free flowing with minimal dust present. There is possibly a very subtle difference in color when compared with current production powder (Goex, Inc.); the Civil War powder is ever so slightly lighter in color. Based on its overall physical appearance, it would not be possible to detect that the Civil War powder was not of current production.

The granulation of the Civil War powder fits well within the range reported for Musket powder of that era. The grain density for the Civil War powder is 1.67 g/cm^3. This is close to that of current production powder and to the current US military specification (1.69 to 1.76 g/cm^3); however, the density is slightly lower than the reported standard of that time (>1.75 g/cm^3). It is uncertain whether there has been a slight change in the powder's density over time, if the powder had been manufactured to a somewhat different standard, or if the current measurement is slightly in error. (Note that the powder used in cannon balls is reputed to have been of somewhat lesser quality than that used for small arms.) The moisture content of the powder is 0.67%, which is still within current military specifications.

In terms of the powder's performance under significant confinement, both in an Eprouvette and in Black Powder rifle tests, the Civil War powder produced results consistently within 7 to 10% of that of current production Goex powder of the same granulation. To help put this performance difference into perspective, it should be noted that past evaluations of other current production (non-Goex) Black Powder performed significantly poorer in the same tests than did this sample of Civil War powder. At this time, it is not possible to say whether the small difference between the Goex and Civil War powders under confinement represents a slight degradation of its performance, as opposed to its having been somewhat less effective when originally produced. Such lesser performance could easily have been the result of small differences in the materials used or in the processing methods used at the time of its manufacture.

The physical appearance, physical properties and performance of the Civil War Black Powder are all consistent with there having been very little or no change in this sample over the preceding 140 years. That is to say, for this sample of Black Powder it is fairly obvious that it has remained stable and shows no sign of having deteriorated. This is fully consistent with what would be expected for a pyrotechnic composition stored under reasonably dry conditions.

One reason for reporting these results for this very old Black Powder sample is that too often bomb technicians seem to be of the opinion that all explosives (including properly stored pyrotechnic compositions) deteriorate and become increasingly unstable with age. While most pyrotechnic compositions, when stored under excessively damp conditions, do potentially deteriorate, very few types of pyrotechnic composition become more unstable than they were originally. Almost always, deteriorated pyrotechnic compositions become more stable, possibly even to the point of being essentially inert. That is not to say, when one does not know the nature of a pyrotechnic composition showing signs of having deteriorated, that one should not use added precaution in render-safe and disposal operations. Rather, one should remember that when speaking of pyrotechnic compositions in general, old does not necessarily mean deteriorated, and that deteriorated pyrotechnic compositions rarely become more sensitive (unstable) as a result of deterioration.