

This article deals mostly with knives and is more or less an information article on celluloid and was found at <http://www.oregonknifecclub.org/celluloid.html>

## "Celluloid - A Firm Maybe"

by ibdennis

A collector of pocket knives or razors is generally very familiar with what are called celluloid handled knives. The collector knows celluloid is a synthetic material that is characterized by durability, unique handle colors and designs. Knives with celluloid handles were manufactured at the turn of the century, but their real popularity came in the 1920's and 30's. The Red White & Blue scout style knives were made of this material, as were the clear handled picture knives and the "Christmas" colored knives. Razor collectors can also attest to the variations on a theme when they find celluloid handled razors. And then there are those who affectionately refer to celluloid as "Genuine Mother-of-Toilet Seat."

We call this material "celluloid," but that is a trade name much like "Kleenex." The first synthetic plastic material was synthesized in 1856 by Alexander Parkes, and then later was developed as a commercial product in 1869 by John Wesley Hyatt. Cellulose dinitrate or pyroxylin was blended with pigments, fillers, camphor and alcohol to make this unique synthetic material. When heated it is pliable and can be made into a variety of shapes and forms. In the paste form it can be colored, rolled or formed into shapes.

To be more accurate we should be calling these handles cellulose dinitrate or pyroxylin handles and not celluloid, however I see little harm in using the term as we have in the past. Sometime in the 1940's or 1950's the use of celluloid on knives was discontinued. The reason was that any of the nitrate products have a special characteristic called "flammability." Cellulose dinitrate is kissing cousins to cellulose trinitrate (nitrocellulose) which is "guncotton." Guncotton is an explosive substance and a propellant. The early makers of celluloid handled knives used terms like pyremite, pyralin, perfected stag, shell, pearl, ivoroy, composition, celluloid and other names for marketing. In fact in looking through the catalogs, specific naming is avoided as much as possible. The reason appears to be the flammability issue. If you dissect the pyremite & pyralin terms used by Remington, you will discover the word "pyro," which means fire but also suggests the use of pyroxylin..



*The 2-3/4 inch steel platform had a tiny piece of celluloid on it that was set on fire. The flames were quite dense and persistent. A large handle that caught on fire would be quite impressive. This suggests caution, "never" buffing or grinding celluloid which could cause it to catch on fire if it got too hot.*

If you take a piece of celluloid and subject it to fire, it will burn with a ferocity that will shock you. A small kernel of celluloid I tested had flames leaping up three to six inches in a very dense, napalm like fire. So the first rule in handling this material is not to grind it or buff it, as such action could get it hot to the point that it could ignite. I was told that one person was grinding on a LF&C perfected stag handle, and before he knew it the whole handle turned to ash. No flames this time, but a very spontaneous melt down. This also proved the point that the LF&C "Perfected Stag handles" were a nitrate based product which is called celluloid.

Whenever I purchase a celluloid handled knife, I await the day that decomposition might start. This decomposition can take on many forms. The most noticeable is the rusting of the knife blade. If you open the blade of a suspect celluloid handled knife, you will often note that the upper part of the blade has rust or a rust stain on it while the balance of the blade is not rusted. Without care the whole blade will become rusted. The next problem associated with celluloid is the self destruction of the handle itself wherein it shrinks, cracks and crumbles on the frame of the knife. I have tried every trick to save a handle like this, but to no avail.



*The rear celluloid handle of this Camillus 1939 Worlds Fair knife is decomposing to the point of cracking and breaking off. The blade shows rusting stains from the leeching effect of the celluloid.*

What I have done in the past is isolate the knives that are suspect, clean them often and make sure that they do not come in contact with any other knives. This is only a stop gap

procedure, as eventually they can go to total self destruct. So then what is happening, and what can be done about these celluloid handles? Are all celluloid handles subject to decomposition? The answer of course is a "firm maybe."



*The front celluloid handle of the 1939 Worlds Fair knife shows no visible signs of decomposition, in contrast to the rear handle. This does not mean that it is not decomposing. It is possible that a catalyst of heat, light or chemicals came in contact with the rear handle, thus activating its decomposition at a faster rate.*

For years I have asked the question, "What do you think is happening to these handles?" Very few could even muster a plausible explanation. I am sorry to say that all my observations at this time are speculative at best, but I think that I am on the right track. Or as they say, this presentation is in the realm of a "firm maybe." I have attempted to stop the decomposition in a variety of ways, but without success. However, I have slowed the effects of the deterioration, even though I haven't stopped it. I do not believe that I will provide a solution to stop this action. So my best bet is to understand and prolong the inevitable as long as I can, without destroying the knife itself.

Norman Chappellie is an industrial chemist in Eugene, Oregon, who seems to have a good handle on the celluloid subject. Over lunch one day I laid out numerous samples of celluloid handled scout utility knives for his observation. Some were heavily decomposed, and others looked as new. The expression that you can't see the forest for the trees certainly fit me this trip, as Norm was able to draw a conclusion rather quickly based on my samples. He also suggested that the washing of our hands was in order after handling these knives.

In short order Norm separated out the decomposed knives and pointed out that all these knives shared one thing in common. Each was light in color or clear. The worst was a clear handled picture knife that showed evidence of an aggressive attack from rust on the blades and bolsters. It was suggested that the clear or light colored handles were without binding material and were subject to deterioration. In the process of making celluloid, the "pretty" that was added to the celluloid acted as a binding or bonding agent, and by accident and not design acted as an inhibiting agent against decomposition. Or if it does start, it does it at a very slow rate that doesn't seem to bother our knives as we see them.

Norm also pointed out that in the old days movie film was made from clear cellulose dinitrate, and we have all heard that this film is decomposing. We have also heard of the

explosive effect that this film has when subjected to heat or flame. The film is clear and has no binding material which could slow or retard the chemical decomposition. It is for this reason that they speak of preserving the old films by putting them on a non decomposing film that is used today.

Years ago I was on tour at Camillus Cutlery, and it was pointed out that one building was used to make their celluloid handle material. The design of the building was unique in that the roof was metal and was hinged. If the celluloid were to catch fire and explode, the roof would release from the force of the explosion, which would save the building and the surrounding area. This action would direct the explosion upward and not outward. At the time I listened, but it was only later that I understood.

I have never seen a red white and blue knife, or for that matter any of the 1930's kitsch variegated handled knives, deteriorate. So if you think dark material is safe, that could be a firm "maybe." We can speculate about two identical knives where one is ravaged with decomposition and the other is pristine. Explanations could be that the one was exposed to heat or extremes of heat, chemicals, light, moisture or other decomposing products that started the action. Once the decomposing action starts, it becomes auto catalytic, meaning it starts a reaction that is automatic and continues to decompose the material. The theory that a binding material slows or prevents this action is then plausible. However if we take a dark celluloid material and subject it to extremes or chemicals, then it too could or might be a candidate for decay.



*From top to bottom: IKCO 1920's Christmas tree celluloid handled knife; Kabar light colored celluloid pearl like handles; 1930's LF&C official BSA knife with celluloid "Perfected Stag" handles; Remington Red White & Blue celluloid (pyremite) handles.*

When a knife blade starts to rust we can say that there is a leeching or exuded chemical reaction. This chemical is more than likely nitric acid, and this certainly explains the fast action rusting effect on a knife blade, back springs or bolsters. Norm stated that his fingers would turn white if he handled this material very much. In my own case my fingers burn when I handle these knives. I now know that this sensation is due to the nitrate exuded chemical or nitric acid based portion of this decomposition. One person I talked to said that they could identify celluloid handles by rubbing them to get them warm, and then smelling the handles which would have the chemical smell. I scoffed at this, but Norm said that this was indeed possible. Many people have a nitrate sensitivity and can actually smell the chemicals. In this person's case the sensitivity came about due to smoking cigarettes which had nitrates in the cigarette paper which helped keep the paper and tobacco burning. Those that smoke can develop a nitrate sensitivity. In my case I could smell nothing. Does ibdennis smoke? Nope by gum; and therefore dear elayne suggests that I missed my opportunity to become a professional celluloid sniffer.

I also spoke with someone at a cutlery factory one time, and they stated that the decomposition of handles was caused by putting knives into clothing drawers where the darkness caused acetic acid to leech out and decompose the handles and rust the blades. This person had no doubt heard that at the time handles were made from cellulose acetate. I scoffed at this idea, but Norm said that there was possible truth in this theory. The decomposing chemical in this case would be acetic acid. It is possible that a chemical action could be started from chemicals in the fabrics, and the acid could build up in the confined location. Light colored handles again could be suspect as they would lack the binding material. In contrast to this would be having the same product out in the open and allowing the gases to dissipate more easily. What is actually the case is unknown, but the theory causes further thoughts which fall into the realm of a "firm maybe."

So the conclusions that can be drawn are somewhat vague, but some finger hold of truth can be extracted. Chemical actions are at play that can cause decomposition of the handles and rusting of metal. This action can be started by heat, light, moisture or chemical actions from other chemicals placed in close contact. Cracking, shrinking or warping can also be products of this decomposition in the case of cellulose dinitrate based handles. In the case of cellulose acetate handles we know that the fire or flammable aspect is not a problem, but we can suspect shrinkage or cracking might take place. From my observations these are more prevalent in light colored handles. And that too is a "firm maybe."

Likewise it should be noted that a light colored or clear celluloid handle may have survived beautifully over the years without decay or decomposition. That does not mean that something cannot suddenly occur that will change this. Call it a chemical time clock or environmental warming or introduced environment changes or whatever.... it could happen. Or if you want to take a more Polly Anna approach, you could say that the chemical composition of this batch of celluloid was made so that chemical decomposition will not occur. Right! Now about that beach front Arizona property that elayne bought and we would like to sell to you.

At one time we collected melon, sausage or produce knives. These knives are characterized by long handles and blades. Celluloid was an ideal handle material for these knives. They were light in color for sanitary reasons, and they could be washed without damage. They also lent themselves to advertising which stood out on a white background. But they were victims to nitrate deterioration. In our collection we were constantly battling which knife was leeching, as it wasn't always the one attacked. A celluloid decomposition on a stainless knife could attack its neighbor first if it were made from carbon steel. For years we played the "Who's on first" game until we finally tired of it. We never seemed to win. Here again the telltale clues were the celluloid handles, and the light colored material that was apparently short of bonding additives.

The sad part of this phenomena is to observe collections that have celluloid objects in them that are under glass and have started the chemical reaction. These can be in museums or personal collections that I am referring to. The best advice I can offer is to make the curator aware of this so that the problem can be properly addressed in a manner befitting the collection. The process of destruction is subtle and can go undetected to the casual observer. As knife collectors and makers we can spot this rather quickly now that we know what to look for.



*These 1950's vintage Brownie knives by Kutmaster have been my worst nightmare. It is possible they have been exposed to an environmental trigger that has prompted their decomposition. In any event they are either clear celluloid (cellulose dinitrate) or clear cellulose acetate that is decomposing and causing the blades to stain and rust. The open knife shows heavy staining on the exposed part of the blade when closed. The "Be Wise, Beware" has a double meaning here.*

One author had a solution to the problem of the decomposing celluloid handle. If you see one for sale; run the opposite direction. If you discover one in your collection; throw it away. That is no doubt sound advice, but I can't come to grips with these solutions. I know that heavy oils or protection wax slows that damage but does not completely protect it. Stop gap technology. Likewise some of these chemical cures could be adding to the problem and speeding the decomposition problem. In my own studies I am currently placing a single knife in a jar that has silica gel crystals in it. I am hoping that the leeching gases or chemicals will be captured by the gel, and it will not get a chance to damage the knife. Time will tell, but I know that I am only prolonging the inevitable.

In my battle to solve this problem I once placed a celluloid handled knife in a plastic bag. Talk about increasing the chemical decomposition and destruction. The trapped gases and nitric acid made quick work on the vulnerable parts of the knife. So I resorted to placing the knives out in the open and watching them closely. Another possible solution would be to place these knives in a freezer to retard the chemical action. This is based on the idea that heat makes the process go faster and the cold could retard the action. Well, maybe someday I'll try that, if the problem continues to haunt me. Can you imagine a display collection at a Knife Show that had to be displayed from a freezer?

There is another solution, and that is to replace the handles completely. This solution destroys the historical significance of the specimen, but it does save the metal. So if you have a knife collection, I would highly recommend that you go through the knives often and frequently to identify possible decomposition. The next thing would be to isolate these knives as far away from all other knives to avoid contamination. Cleaning and special care will preserve the knife longer so that you can enjoy it, but you will eventually have to come to grips that this knife is dying. And from there you are on your own. And that is "not" a "firm maybe."

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