

The Belleek Lustre Project

By Chris Marvell

This is a practical investigation into the nature of the Belleek coloured lustre decoration, which is often found on teaware items, notably Grass and Chinese pattern. It is also used on decorative pieces such as the Tulip vases, Fish vases and other major pieces. One problem, noted by many collectors, is that the lustre decoration varies greatly in intensity and appears to deteriorate with age or wear. The investigation was to establish the durability of the lustre under different conditions and chart the changes seen in the colour and intensity of the decoration during the tests.



Detail of Chinese tray, decoration no. 3: gilt/bronze with lustre

Background Information

The Belleek lustre in question derives from an original recipe patented by the Frenchman J.J.H. Brianchon in 1857, although some authors believe that Armstrong himself developed the type of lustre that Belleek used. Regardless of this, the Belleek Pottery licensed Brianchon's patent for use in producing a decorative finish. We see the lustre in several forms.

1. As a clear (colourless) glaze imparting a shiny and/or iridescent finish to items such as baskets, applied flowers on vases and jardinières and glazed parts of figures and other large pieces. Also sometimes used in preference to the normal (non-lustre) glaze with some items of teaware where a very fine eggshell effect is enhanced by the slight iridescence: this can be seen on "eggshell" Echinus teaware and Chinese teaware and possibly on other types of teaware (it has been seen on Low Lily) where a very fine finish was required.
2. As a coloured wash on the interiors of cups and the centres of saucers in some teaware patterns. Also sometimes used on the interiors of vases and other decorative pieces, this yellow lustre which we refer to as "cob" gives an attractive shiny, slightly iridescent finish.
3. As coloured decoration to various types of teaware, principally Grass and Chinese and on vases, centrepieces and other decorative items. This coloured decoration is mainly green and purple but is seen in many shades from very intense dark purple through mauve, light green, turquoise and faint pink or purple.

It is this third type of lustre decoration which forms the basis of this study, as it is the changes in the colouration due to time, various solvents and general wear, that we are interested in here. It is probable that the findings of this study can be applied to the colourless lustre and also the cob lustre as the coloured lustre takes the same form of these others. The coloured lustre has been studied as this shows changes in a much more obvious way than the other types.

Present day Belleek can still be purchased with the clear iridescent lustre (for example the Cherub Candelabra) but it is not nowadays made to the same recipe as Armstrong's original. The original lustre contained bismuth nitrate, resin and lavender oil [Shinn and Shinn] and although there does not appear to be anything harmful about lavender oil, the vapour produced by metallic compounds when fired at high temperature is today considered too harmful: Belleek no longer uses lead-based glazes or (to my knowledge) any other volatile metallic compounds in its glazes or decorations. This is in one way rather unfortunate as we are now deprived of the wonderful delicate effects seen in (for example) the first and second period Grass pattern teaware: when the Grass tea set was re-introduced a few years ago as a series of collectors' items, it was decorated in a non-lustre painted finish instead of the original decoration.

So it is only early Belleek of the black mark periods that concerns us in this article. Cob lustre continued to be used into the Green mark periods and later but the coloured lustre that we are really concerned with was used less and less after the first and second periods and it is no longer used today.

Lustre decoration in general is by no means a Victorian invention. The patent that Jules Brianchon gained was for a variation on the technique of producing a lustre glaze, not for the invention of lustre itself. The Persians, Syrians and Mesopotamians famously made lustre decorated tiles, chargers and vases as early as the 12th century but it is generally accepted that the technique was first discovered (possibly in Syria) in the 9th century. The techniques of producing this lustre are now well known and involve incorporating metallic salts, usually containing copper or silver into a glaze which is then fired in a kiln containing a reducing atmosphere (in the absence of oxygen). The effect is partially to convert the metallic salts in the glaze into the metal itself, which gives the iridescent effect in the finished product. The iridescence is caused by a light interference effect, not by a pigment – this is the same type of colour effect as seen in a butterfly's wings, or in a thin film of petrol on water.

Lustre decoration came to the forefront in late Victorian times and in the early twentieth century, when potters such as William de Morgan and art pottery companies such as Pilkingtons and Ruskin, striving to reproduce (or better) the effects that the Persians developed, produced many wonderful pieces, usually tiles, jugs, vases or large chargers. The lustre effects were achieved with copper and other metals in the glaze and colourful effects in red, blue, green (and in Pilkington's case a whole range of other colours) were very successfully produced.

The lustre decoration which Armstrong developed at Belleek was intended for a quite different purpose to that of the ancient Persian potters or of de Morgan or Pilkingtons. Armstrong generally didn't want these bold and strong colours, he strove for a subtle and even "natural" iridescence. This was highly appropriate to some of the ware that Belleek produced, particularly that based on sea shells, where a "mother of pearl" effect was achieved with great success. With regard to lustre decoration, it is fair to say that Armstrong, in the 1860's and 1870's, at the Belleek Pottery, succeeded in producing a naturalistic effect which was *by far* superior to any of the other manufacturers, either at the time, before or since. We have all seen examples of iridescent lustre, whether on the cheap late Victorian Continental imitations of Belleek, the poor 20th Century Japanese Belleek-like ware, the very good Worcester items or on other pieces of British Victorian and later potteries such as Maling or Shelley. These may have a highly effective iridescent finish but they cannot compare to the delicacy and fine sheen of the lustre perfected in the first period by R.W. Armstrong at Belleek.

Extent of the Investigation

So the Belleek lustre is a highly desirable form of decoration which is individual to Belleek. The lustre is however prone to deterioration and damage. This article sets out to answer three questions:

1. What should the Belleek coloured lustre look like? What was it like when freshly produced?
2. How does the Belleek coloured lustre change with time, wear and mistreatment?
3. What factors or agents have a damaging effect on Belleek coloured lustre?

To this end, a series of experiments were devised. This involved firstly obtaining some suitable objects for experimentation. A pair of first period Grass pattern cups and saucers were purchased inexpensively on Ebay – they were inexpensive because they had suffered chips, cracks and other damage, but the lustre decoration was in good condition. These items were used along with a Grass sugar bowl which was badly cracked. Even given the poor condition of these items, it was still fairly painful to subject them to treatment which would potentially damage them further – even cracked Belleek is precious – but in the name of science and because the information gained would allow collectors to look after their valuable possessions better, the tests were carried out.

The tests involved subjecting the various pieces of Grass pattern teaware to conditions that they might reasonably encounter in daily use, although at a more severe level than that normally suffered by valuable collectors' items!

The Tests

1. Controls: items which were placed in a closed drawer where they would not be subject to light, heat, washing, scratching, rubbing, any solvents or any other type of harm. (Items 1 and 6 in the tests)
2. Items which were left exposed to sunlight (through glass) on a South-facing windowsill for a protracted period to see if there was a bleaching effect due to ultraviolet or other light. (Items 4, 7 and 8 in the tests)
3. Items which were subjected to daily handling and washing. (Items 5 and 9 in the tests)
4. An item immersed in a weak acid solvent, in this case lemon juice. (Item 3 in the tests)
5. An item immersed in a chemical bleach, in this case Chlorine-based household bleach. (Item 2 in the tests)

Items in each of these five categories were photographed before the tests started and then again at later dates. Photographs were taken as follows:

1. Before the start of the tests
2. After the tests had been running for 9 days
3. After the tests had been running for 70 days (just over 2 months)
4. After the tests had been running for 350 days (approximately 1 year)

Results



Above: the set of items in the trial, before the tests began.

They are numbered for identification as follows:

- 1 (shard) control in dark drawer
- 2 (shard) in chlorine bleach diluted 5:1 in covered glass dish in dark drawer
- 3 (shard) in lime/lemon juice in covered glass dish in dark drawer
- 4 (shard) facing Sun, lying flat (behind glass window) on South facing windowsill
- 5 (saucer) upstairs kitchen to be washed up daily (if possible)
- 6 (saucer) control in dark drawer
- 7 (cup) facing Sun, standing upright (behind glass window) on South facing windowsill
- 8 (cup) facing away from Sun on South facing windowsill
- 9 (sugar) downstairs kitchen to be washed up (vigourously) daily (if possible)

All the items were first period Grass pattern, with the painted decoration number “2” meaning that they had coloured lustre decoration and gilding.

In the tests, attempts were made to photograph the items under the same conditions each time. Please note however that the final set of photos, after 350 days, were taken on a dark blue-grey background rather than the dark grey background of the other three sets.



Item 1:
Control 1

At start, 9 days,
70 days and 350
days.



Item 6:
Control 2

At start, 9 days,
70 days and 350
days.

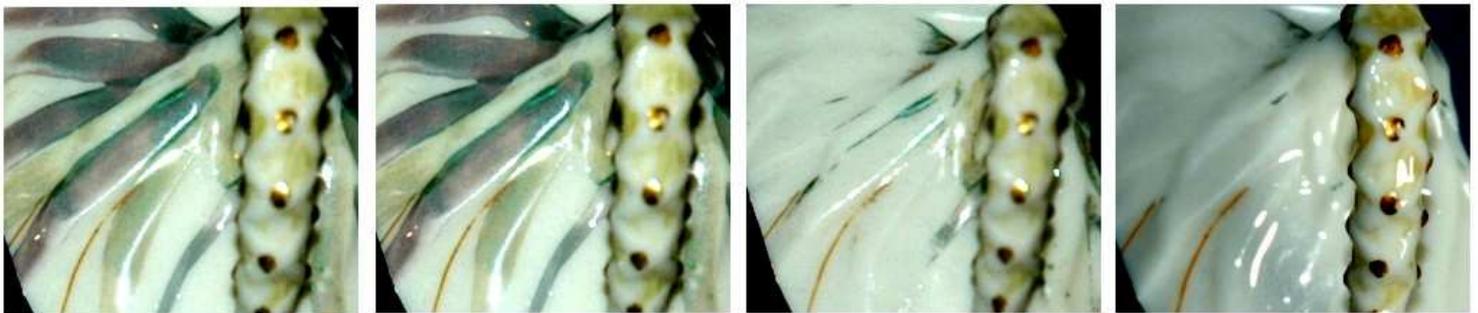
As expected, neither item shows any perceptible changes to the lustre in intensity, colour or wear.



Item 2: Part of
a cup with
handle attached
- immersed in
Chlorine
Bleach.

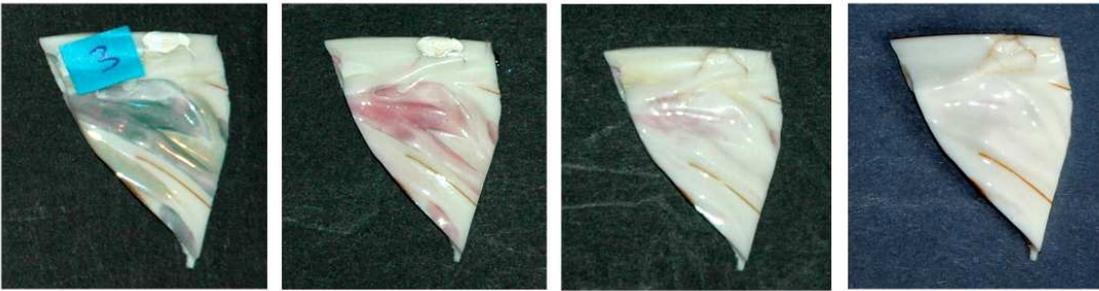
At start, 9 days,
70 days and 350
days.

Detail near handle shown below.



This item, which was left immersed in household Chlorine bleach, diluted 1:5, shows that the coloured lustre is eventually almost entirely removed. After 9 days, no loss is shown but after 70 days, although most of the lustre has gone, the remaining coloured lustre seems not to have changed in colour or intensity. This process is shown to have continued up until the 350 day point when almost all of the lustre has disappeared, the tiny fragments remaining however still seem to be the same colour and intensity as they were at the start of the trial.

The gilding and decoration on the cup's handle and the normal painted decoration (the fine grass stems in brown) seems not to have changed over the course of this test. Note that the little blue label disintegrates immediately when immersed in bleach!



Item 3. A small shard from a cup – immersed in undiluted fresh lemon juice

At start, 9 days, 70 days and 350 days.

Detail shown below



This item, which was left immersed in undiluted lemon juice, refreshed and topped up as required, shows marked changes in the colour and intensity of the lustre with time:

Initial colour:	Green/blue with purple hints.	Intensity:	vivid colours
9 days:	Red/purple with some pink.	Intensity:	less vivid but still strong colours
70 days:	Pink and faint pink.	Intensity:	faint colours
350 days:	Virtually no lustre present at all.	Intensity:	extremely faint/none

This shows that the acid lemon juice (containing mainly citric acid and ascorbic acid) has firstly changed the colour of the lustre, then caused it to fade, finally removing it altogether. The lemon juice has no apparent effect on the normal painted (non-lustre) decoration (the fine brown grass stem). The lemon juice immediately causes the little blue identification label to disintegrate.



Item 4: Shard from a cup, exposed to sunlight through glass, facing upwards, on a South-facing windowsill.

At start, 9 days, 70 days and 350 days.



Items 7 and 8: Cup, exposed to sunlight through glass, with side (7) facing the Sun and side (8) facing away from the Sun, the cup standing upright on a South-facing windowsill.

At start, 9 days, 70 days and 350 days.

Note that the effect of the Sun's bleaching on the lustre is very slight – almost imperceptible over the 350 day period. The Sun has been strong enough to fade the writing on the small blue identification labels so that they are almost unreadable in the 350 day picture. There is very little or no effect on the coloured lustre due to sunlight through glass – only item 7 after 350 days is possibly showing a very slight effect. The test over approximately one calendar year includes the sunlight in all four seasons and all weather conditions. The result is surprising as the UV energy in sunlight normally has a very strong bleaching effect (well demonstrated on fabrics and some paint finishes and also on the written numbers on the blue identification labels). It is possible that a longer trial, or a trial in conditions of stronger sunlight (not in England!) or a trial in the open air without intervening window glass to attenuate the UV might show more significant deterioration of the lustre: we will continue the trial further to establish this (at least under English conditions).



Item 5: Saucer, left in the kitchen to be washed up frequently (in practice once every 2-3 days)

Item 9: Sugar bowl, washed up frequently and vigorously (with scouring pad).

At start, 9 days, 70 days and 350 days.

Note that the vigorous washing up has eventually caused the cracked and restored sugar bowl to break into pieces along the lines where it was glued.

Below is detail of the sugar bowl (Item 9) at the start and at 350 days.



This shows that the repeated scrubbing of the sugar bowl with a scouring sponge has caused wear to the lustre decoration and *also to the gilding*. This wear is caused by mechanical rubbing rather than any effect of the water or washing-up liquid and is only to be expected given the extreme nature of the treatment. The loss to the decoration is on the more raised and accessible parts of the item.

Conclusions

The Belleek coloured lustre can be damaged by three mechanisms

1. The effect of lemon juice which causes colour change and loss of the lustre
2. The effect of Chlorine bleach which causes no colour change but does destroy the lustre
3. The effect of mechanical rubbing which eventually causes lustre loss

The most dramatic changes to the lustre occur when it is exposed to **lemon juice**. This causes colour change and then attenuation of the brightness of the lustre, eventually leading to its complete loss. It is reasonable to conjecture that it is

the acidity of the lemon juice which causes this. It is also reasonable to conjecture that other strong acids, such as Hydrochloric, Sulphuric, Phosphoric and Hydrofluoric will cause similar effects but probably much faster. It is also reasonable to conjecture that weak acids, such as commonly found in food and drink and generally around the home will also cause this effect to a similar or lesser extent. The most damaging type of acidity might very well be that which occurs naturally in sweat, so that even simply *handling* Belleek lustre items over a protracted period, or handling them and then not washing them adequately, will cause the lustre to change colour, lessen in intensity and eventually disappear altogether.

Chlorine bleach has a dramatic effect. The effect seems to take the form of weakening the adhesion of the lustre to the item, so that it becomes much easier to remove it by rubbing, washing and even by simple handling. No change in the colour of the lustre is seen in this case, it merely disappears with residual bits of lustre remaining in crevices or protected areas of an item. It is probable that other bleaching chemicals such as Hydrogen Peroxide will have a similar effect. This means that if Belleek lustre items are cleaned with bleach or strongly oxidizing agents (Peroxide or Oxygen-based bleaches) then great care should be taken and the items should be washed thoroughly with clean water afterwards.

Mechanical rubbing, if vigorous enough, simply wears the decoration off the item: this finding is obvious but it should be noted that the decoration *is* resilient and reasonable amounts of careful washing up will not perceptibly damage the lustre decoration.

Washing up liquid and by inference other detergents seems to have no appreciable effect on the lustre decoration. It appears to be safe to wash up these items in the normal way as long as vigorous scrubbing is avoided. "Lemon" washing up liquid probably does not contain real lemon juice, just the scent, or else this would have to be avoided too!

The effect of **sunlight** in this test was to leave the lustre effectively unaltered. This was surprising as UV light normally has a very strong bleaching effect (as we often see when furniture and fabrics fade in the sunlight). This finding that sunlight has little or no effect should be considered carefully, as it is possible that a longer trial, a trial in conditions of stronger sunlight (not in England!) or a trial in the open air without intervening window glass to attenuate the UV might show deterioration of the lustre.



In the discussion of the colours of Belleek lustre, in Grass, Chinese, Lace and other teaware patterns and on highly decorative Tulip and Fish vases, it has been speculated that the items were originally available in different coloured lustre – blue/green or purple. In this experiment it has been shown that a radical colour change can easily be caused by the simple use of a weak acid (lemon juice). It is clear that although Belleek items were originally available in different colours of lustre, it is highly probable that over the life of any given lustre-decorated item, colour changes will occur, even given reasonably careful handling, over very long time periods. It is also clear that the sequence of colour changes are fairly predictable.



The items shown here exhibit signs of colour change and wear: the Double Fish Vase (above left) shows the lustre degenerating to pink and purple and a good deal of rubbing; this vase also shows two colours of lustre originally: the blue/green/purple on the leaves which has faded to pink/purple and the red/brown on the base, also showing signs of fading to purple. The rare first period lustre decorated Shamrock saucer in decoration number 9 (above right) shows rubbing to the high points and some fading, although the original blue/green/purple is actually in good condition.

It appears from examination of many pieces of lustre decorated Belleek that the original colour was normally either a vivid blue/green or a strong dark purple although other colours were also regularly used (mainly red/brown). Some pieces may have more than one colour present. The general colour change sequence is then as follows:

Green or Blue/Green > Dark purple > Purple/Mauve/Red > Pink > Pale Pink > White (no lustre left)



If a Belleek item has been kept in exceptionally good conditions, i.e. in a display cabinet and never handled or cleaned, then it is possible that a first period item may still exhibit the very strong blue/green or dark purple lustre. It is much more common, however, to see first period items which exhibit a pale mauve, purple or pink colour. The conclusion is that this is the result of the deterioration of the lustre due to the way it has been treated over the very long period of time. It is possible, that Belleek made lustre decorated items in shades of mauve or pale pink but this seems much less likely than the pottery making the items with intensely coloured lustre which then faded to the more pastel colours. That this is the case is shown by Belleek pottery making no distinction between the strong and weak lustre colours or the green/blue and purple colours in its decoration way numbering system (see articles and pictures researched by Bev Marvell on Belleek painted numbers).

To sum up: if you have a Grass Pattern item (normal colourway 1 or 2) which has no lustre or a faint pink lustre, it would originally have had vivid blue/green and purple lustre and has faded to the pastel pink colour due to handling or mistreatment over its life. To keep the lustre decoration safe, avoid exposing the items to acids or bleaches. It's alright to wash up the items but don't do it too frequently or too vigorously. And finally, when handling the items, wash your hands beforehand and wash the item gently after it has undergone a lot of handling.



Pictures on this page: Above: Onion spill showing red lustre on roots and purple lustre on leaves, fading to mauve and pink. Above right: Lily basket showing signs of fading to pink. Right: Celery vase with rubbing and fading to pink/mauve – note that the gilding has remained intact and bright.

References:

Bev Marvell: The Extent and Purpose of Painted Numbers, UK Belleek Collectors' Group Newsletter 25/1 April 2004.

Bev Marvell: <http://www.belleek.org.uk/belleek/Numbers/Belleek%20Marks.htm> – list of Belleek decoration ways

Charles and Dorrie Shinn: The Illustrated Guide to Victorian Parian China, Barrie and Jenkins, London, 1971
ISBN 0.257.65121.7