Mending as Making

Understanding recycling in a post-Roman context

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Introduction

Recycling as an alternate source of Saxon glass is often posited, but the precise nature and extent is unknown. Roman recycling is seen as a part of industry, but in the early medieval period it is couched in the terms of scavenging, evidence of a failing society.

Using newly defined recycling terminology, previous chemical analyses of British glasses are considered for likely markers of recycling. By considering the proportions of the material that is 'likely recycled', the first step has been made towards addressing the question of whether Saxon glass was sourced from *'a gradually diminishing and degrading reservoir of cullet, ultimately derived from the prodigious industries of the 1st to 4th centuries'*.[9]

Reuse, Repair and Remelt

Recycling has increasingly become a focus of archaeometric studies [5][8]. However, there are a multitude of behaviours that have been referred to as recycling. These can be wildly different, and each has specific physical and chemical markers, as well as unique social and economic considerations. All practises can be broadly categorised into the areas of reuse, repair and remelting.

Reuse: Glass in which there have been no physical changes, beyond minor maintenance or decoration, but has undergone a change of purpose, place, owner or cultural significance. This covers both the finishing of glass, such as enamelling, as well as simple curation or reclamation. An example of this is the common appearance of early Roman glass in Anglo-Saxon burials, such as at Orpington, London [21].

Repair: Minor physical alterations so the object can continue its previous function or assume a new one. This can apply to the object as a whole or parts. Again this is common early medieval Britian, where sherds of earlier Roman glass and beads are maintained as amulets [14].

Remelting: Encompassing what most people consider to be 'recycling', it requires the object(s) to return to a liquid phase, either with the loss or addition of material. Sherds can be collected together for a specific object, or many objects. Individual sherds can even be melted to make individual beads or gaming tokens [6].

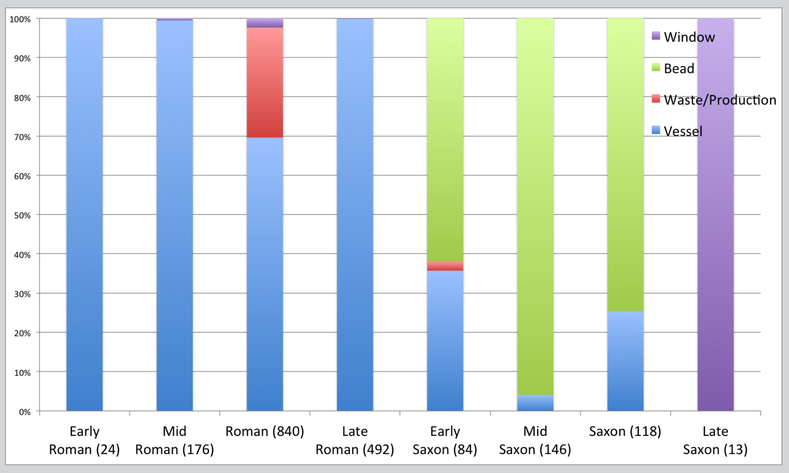
Cullet production is strongly attested, historically and archaeologically in the both periods, sometimes with the addition of specific material to achieve a finish, ie. coloured tesserae.

Identifying Glass Recycling

Glass recycling can be identified by traditional archaeological means, particularly in cases of *reuse* or *repair*, however it is more problematic when remelting has occurred. In some cases, evidence is found of production from cullet, but recycling is often extrapolated from other archaeological evidence, such as the lack of large glass sherds from later sites in Britain, assumed caused by curation. Similarly, the changing use of glass, particularly seen in Britain with the strong move away from vessels which require more, high quality glass, towards beads which require both less glass and less expertise [Fig. 1]. Historically, it has been assumed the increasing scarcity of glass greatly affected the social value of the material.

Glasses have been separated broadly Roman and Saxon, and when possible into smaller periods: Early Roman (43-150), Mid Roman (150-350), Late Roman (350-450), Early Saxon (450-650), Mid Saxon (650-850) and Late Saxon (850-1066). (See: Database of Glasses)

Figure 1



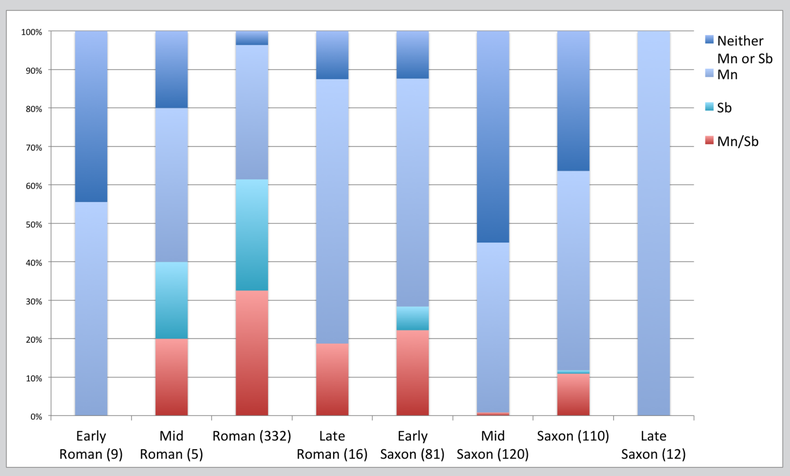
Percentage of forms of glass by period.

Chemical Markers

There are specific chemical changes that have been linked to remelting [8]. By looking for large scale compositional trends across time, glasses that are likely recycled begin to appear. In particular, manganese (Mn) and antimony (Sb), have proven particularly useful. They all have multiple sources in the making of fresh glass, but are predominately deliberate additions. Soda glass is made of sand and natural evaporite salt, but untreated raw glass is unlikely to contain above 0.2% Sb and 0.3% Mn so these are used as presence cutoffs. Prior to end of the third century, antimony is added as both a decolourant and, infrequently, as an opacifier, a role that is later assumed by manganese. Around the same time it is introduced as a decolourant, a new type of glass (HIMT) is introduced with naturally high iron, manganese and titanium, raising Mn in fresh glass to just below 1%, however this means its absence is also interesting in glass of the fourth century onwards.

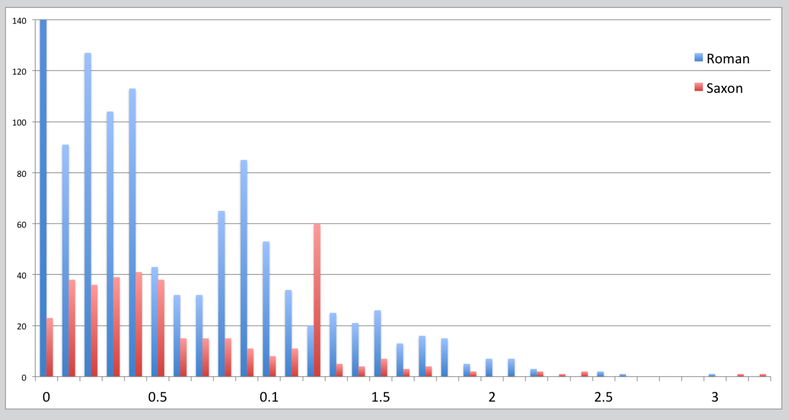
The appearance of high levels of Sb and Mn together show likely recycled glass, where cullet containing material treated with each has been remelted together. Similarly, Sb from the fourth century onwards, or at any time in non-opaque coloured glass, indicates possible recycling. The most common explanation is the inclusion of high coloured, opaque tesserae as dye blocks, but could also be the inclusion of Sb decoloured glass, similarly high Mn.

Figure 2



Presence/absence of Mn and Sb in coloured glass by ubiquity.

Figure 3



Histogram of percentage of Mn in coloured glasses.

Discussion

Roman Glasses: When looking at the Mid Roman coloured glasses [Fig. 2], only one of the five glasses contains the expected absence of Mn and Sb, whereas three contain a single decolourant and one both. None are opaque, nor are they likely to be HIMT glass, which appears at the very end of this period. While comments on manganese glass is more problematic for Roman glasses, over 60% of coloured glass have unexpectedly high antimony.

Of the later glasses, three of the fourteen have over 1% Mn, higher than one would expect from HIMT glass, and the rest spread between 0.2-1%. This range is most easily explained by the inclusion of some HIMT or Mn decolourised glass in a mix.

Saxon Glasses: Under 30% of the earlier glasses have Sb, likely recycled in this period, and 50% with Mn have greater than 1%, so not just HIMT glass. Into the middle period, Sb seems to disappear, but some of this has to do with a failure to accurately measure it. Apart from several high examples, Mn is low for HIMT glass, starting around 0.75%, then consistently tapering off. This perhaps pointing towards a mixing of HIMT with the lower Mn Levantine style glass [Fig. 3]. This means that a huge proportion of glasses that falls below the Mn cut off line, so are labelled as baring no Mn or Sb, might actually better be explained by a continued mixing such that less Mn is apparent per glass.

Conclusions

Saxon coloured glasses show that a considerable portion of glass entering the mix is of a pre-fourth century Roman colourless composition (high in Sb and/or constant low level Mn). Although in some ways, these results have shown that recycling is common in both the Roman and Saxon period, the lessening spread of low value Sb in later glass does lean towards the idea that there is a constant remelting, spreading the antimony thinner. However the clear jump in Mn, with averages being constantly higher than Roman glasses, including HIMT glasses, hint at a more complex story. With further, more precise analyses of Saxon glasses, a clearer picture will hopefully begin to form.

Database of Glasses

Twenty papers containing compositional values of 1900 British glasses [1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 22, 23].

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