

Re: Copper Casting In America (Trevelyan)

Source: <http://sci.tech-archive.net/Archive/sci.archaeology/2004-07/0261.html>

From: Eric Stevens (eric.stevens_at_sum.co.nz)

Date: 07/03/04

Date: Sat, 03 Jul 2004 21:49:44 +1200

On Sat, 03 Jul 2004 07:27:39 GMT, Seppo Renfors <Renfors@not.com.au> wrote:

>

>

>Gary Coffman wrote:

>>

>> On Fri, 02 Jul 2004 07:53:30 GMT, Seppo Renfors <Renfors@not.com.au> wrote:

>> >Gary Coffman wrote:

>> >>

>> >> On Thu, 01 Jul 2004 12:10:10 GMT, Seppo Renfors <Renfors@not.com.au> wrote:

>> >> >Gary Coffman wrote:

>> >> >> On Tue, 29 Jun 2004 07:05:25 GMT, Seppo Renfors <Renfors@not.com.au> wrote:

>> >> >> >This has a good story about the Great lakes Copper deposits.

>> >> >> ><http://www.geo.msu.edu/geo333/copper.html>

>> >> >>

>> >> >> As that article notes, 14 billion pounds of copper have been removed

>> >> >> from the area since the ancients were working copper there. Let the

>> >> >> enormity of that number sink in. There was an *awful lot* of copper

>> >> >> there in ancient times, much of it easily accessible from the surface.

>> >> >

>> >> >My main interest was to show the formation of the copper deposits –

>> >> >the volcanic activity that melted it (and other minerals with it).

>> >> >Silver is/was found in fair quantities alongside the copper. What

>> >> >isn't known – because nobody cares to find out, is the composition of

>> >> >the metal used in the artefacts. It is ASSUMED to be pure copper.

>> >>

>> >> The presence of silver inclusions *proves* the native copper was not

>> >> melted after being deposited.

>> >

>> >...but only for that piece – not for any other piece. Further more

>> >IIRC there is a method of laminating copper and silver sheet and

>> >carving through one into the other. It is a Japanese technique IIRC.

>> >It requires being heated under pressure, to the point the silver just

>> >starts "sweating" and it brazes the sheets together. So silver in

>> >copper can also be deliberate – as decoration.

>>

>> It is called silver brazing (or more commonly, but incorrectly, called

>> silver soldering).
>
>I already said it was brazing. I couldn't think of the specific
>decoration name before, but it is used in making "mokume gane" as
>found, and originating on samurai sword handles from about 1600 –>
>1800.
>
>> It is a common technique used to join pieces of
>> copper. Pressure is not required. A temperature in excess of 800F
>> is required for brazing to occur (by ASTM definition).
>
>Are you suggesting silver "sweats" (forms liquid beads) way below its
>melting point?
>
>> >> Native copper is deposited by chemical
>> >> means, not volcanic melting and extrusion.
>> >
>> >I already posted this earlier. It disagrees with you:
>> >
>> ><http://www.geo.msu.edu/geo333/copper.html>
>> >
>> >"chemical" doesn't get a single mention.
>>
>> Actually, it doesn't disagree with me. It says the copper
>> was carried in an aqueous solution from great depths
>> and deposited in the vents, fissures, and voids of the
>> iron bearing rocks above. The pertinent chemical
>> reaction involved is
>>
>> $CuSO_4 + Fe(Metal) \Rightarrow FeSO_4 + Cu (Metal)$
>>
>> If you were knowledgeable of the chemistry of copper, this
>> would have been obvious to you. If you had read any of the
>> many geochemical references in the links already provided
>> in this thread, it would have been spelled out for you in
>> excruciating detail.
>
>If you had not been so intent on being snaky you would know that
>"aqueous" (correct spelling) also means "water like", "watery" as well
>as "of or containing water" – therefor it is NOT a clear explanatory
>term in itself. Further to that, you would NOT have written that
>formula up there – but if you want to argue that particular formula
>(A) point out how two solids, suddenly for no given reason, decides to
>react and change (B) how they get together in the first place when
>they are NOT ambulatory in any way.

<http://www.cop.ufl.edu/safezone/prokai/pha5100/eumix.htm> illustrates the basic mechanism. The same kind of thing happens with copper and silver. The presence of silver will lower the melting point of the copper and a solid solution will be formed. In the case of copper and silver

<http://www.bipm.fr/metrologia/ViewArticle.jsp?VOLUME=25&PAGE=41-47>

gives the lowest melting temperature as 779.583 plus-minus 0.060 which is lower than the melting point of either copper or silver.

Many metals will form similar eutectic mixtures with copper, particularly aluminium and zinc. Some tin-lead solders will form eutectic mixtures with high alloy steels at quite low temperatures, which is why at an early stage they stopped soldering identifying labels onto aircraft undercarriage legs. :-)

>Oh and where are these pure iron

>deposits, hmmm? It sure as hell would have saved on building blast

>furnaces if that existed...

>

>You could have instead pointed to this section in that same article:

>"Into the lava flows of Keweenaw, Houghton, and Ontonagon counties

>percolating hot waters rising from great depths brought copper and

>silver in solution. As it cooled, the waters filled the fissures and

>the gas cavities (amygdules) of the lavas (trap rocks) with pure

>copper and silver..."

>

>Now here we see something totally different from your "formula". There

>IS a mention of a "solution" – most likely the copper portion was

>CuSO₄.5H₂O. There is not a single mention of iron. It also refers to a

>heat source – not two ambulatory minerals meeting in the dark for a

>bit of kissy kissy, saliva swapping or any other hanky-panky!

>

>So what have we here – we have the result of hot lava, the water

>"evaporates" leaving what would be known as, Blue copper, Blue stone

>or Blue vitriol (among other things) or CuSO₄. Indeed it does exist,

>but it isn't your pure Cu, is it.

>

>BUT if I again go back to your "formula" and introduce some "Fe" into

>the equation, it has to be as "FeSO₄.H₂O" solution – 100% water

>soluble (used in animal feeds as a supplement). Perhaps more

>interesting is the FeSO₄.7H₂O (copperas), also water soluble, but is

>blue in colour similar to copper sulphate and in its solid form it

>melts at 64 deg. C! Only problem is that this requires no hanky-panky

>at all.... the Fe is pregnant with SO₄ already!

I suggest you read the opening paragraphs of

http://www.minsocam.org/MSA/collectors_corner/vft/mi2c.htm

Please don't take this as a contradiction. I intend it as an

elucidation. :-)

>

>So lets add the bit of "mood" to the situation and heat it up with the

>cooling lava. The result would indeed be ferrous and cupric oxides,

>respectively, giving off water and sulphur trioxide, which combine to

>produce a dilute solution of sulphuric acid.

>

>So IF there is either some "copperas" or Ferrous Sulphate Monohydrate

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>in the $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ – then one can expect IRON to be present with the
>copper – well.... yes but not in the same place by the look of it. But
>then if we take both the copper and Iron out of the soup we end up
>with H_2SO_4 or masses of sulphuric acid (oil of vitriol)! Therefor
>Lake Superior is a lake of acid. Then the Moral of the Story is:
>don't eat the fish as they will eat your insides out!
>
>Now, I have to admit I have have happily forgotten 99% of what I ever
>learned about chemistry (except that needed to make moonshine), but
>then again, why on earth am I required to know any of it.....?? To
>prevent you getting all snooty by suggesting things??
>
>
>[..]

Eric Stevens