Further thoughts on the effect of the copper bands on T_out measurement Alan Goldwater 20 April 2013

This configuration approximates over a small area the metal-encased concentric calorimeter, in that it is capable of measuring the substantial cell heat output of IR emission. This is an important improvement over an all-glass cell in several ways that have been discussed previously. The issue then is that blacking the entire copper band will also increase the emissivity of the outside surface. While this can be corrected to some degree with a S-B calculation, it's always better to eliminate a possible variable rather than calculate its estimated effect.

Hyperion-EF makes a Coldshield product specifically for this application, and is the source of the graph for CuO Reflectivity.
http://www.hyperion-ef.com/images/ebonol1.gif
http://www.hyperion-ef.com/primer.htm

Here's what they say about the coatings:
"**Two surface coatings are commonly used on coldshields. Gold for high reflectivity on the exterior, and copper oxide for good absorption on the interior."**

It seems to me that this approach should be followed. If gold plating before selective oxide treatment is too expensive, the outside of the bands could be polished and the surface then protected from oxidation with a high temp clear coat, available in aerosol for automotive applications. It will probably yellow a bit at 150C but that's better than the polished copper turning dark.

Ebonol C is widely used in electronics for heat sink finishing, and in vacuum-rated optics for aerospace. It's a plating-type process and might be available locally from industrial plating suplliers.
The finish is durable but will degrate at high humidity and temperature -not an issue for us.

One online reference says that the treatment bath is lye mixed with sodium chlorite. Probably not practical for D.I.Y. See below for alternatives.

Some D.I.Y alternatives to produce copper oxide finish:

Eastwood Blackening Solution 1 pint $18
http://www.eastwood.com/ew-metal-blackening-solution-1-pt.html?srccode=mn130080
this one is selenium dioxide, copper sulfate, nickel chloride and phosphoric acid.

EPI Black Oxide
http://www.epi.com/c/black-oxide?gclid=CNzjkbex2LYCFYU5QgodYyoAuQ
http://www.epi.com/c/black-oxide/copper-brass-bronze-white-bronze
This site suggests sample quantity is available
"There is a small fee for samples shipped in the continental U.S. This can range from $10-$75"

Another D.I.Y method at http://www.practicalmachinist.com/vb/general-archive/blackening-brass-96221/

"I blacken brass all the time with the following: make a super-saturated solution of copper carbonate (CuCO3Cu(OH)2) and regular, over-the-counter ammonia (what you use to clean with). The longer you leave the brass part in the solution, the darker it will get! I have to manufacture custom camera bushings and eyepiece inserts all the time - that need to be black to prevent light reflections. This is the same chemical staining procedure used by Zeiss and Leitz(Leica). It produces a finish that replicates black anodizing on aluminum."

Copper Carbonate is used as a pottery glaze, might be called Malachite

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http://ssschemical.com/
Black c-33 $90/gallon. samples 8 oz. for $13 each plus shipping.
contains Selenious Acid, Copper Chloride and Phosphoric Acid

Copper Carbonate $28 1 lb.

Mil-F-495E Finish, Chemical, Black, for Copper Alloys no process specified, just performance.