

CHEMISTRY IN YOUR WORLD

Science, Technology, and Society

Real Gold

Recently, a woman wrote to Annie's Mailbox complaining that the necklace her boyfriend had given her turned her neck green. Her concern was whether the necklace was "real gold." This leads to the question: What is "real gold"? To chemists, real gold is pure gold, called 24-carat gold by jewelers. Thus, when you see 24K (for "carat," which is also spelled "karat") on a piece of gold, it means that it is 100% gold. However, the woman's necklace was surely not 24K gold, because pure gold is too soft for making jewelry. Jewelry is usually made of 18K gold (which is $18/24 = 75\%$ gold by mass) or 14K gold ($14/24 = 58\%$ gold). The carat system was invented by the British in about 1300 to provide a standard for the use of gold as currency.

In the United States, the lowest carat designation for gold is 10K. Because a 0.5-carat error is allowed, 10K gold is actually 9.5K or 39.6% gold by mass. So if 9.5K gold is only about 40% gold, what makes

up the rest of the "gold" jewelry? The metals most commonly used to form gold alloys are copper, silver, zinc, and nickel, depending on the specific use and color desired. For example, "yellow gold" typically contains Au, Cu, Ag, and Zn, whereas "white gold" contains Au, Cu, Ni, and Zn.

Now back to the woman's original question. Was her necklace "real gold"? Not likely. The necklace was probably mostly copper with a thin layer of gold plated on the surface. The woman's necklace turned green because copper "leaked" through cracks in the gold plating. Alloys of 14K gold do not behave in this way. She was right to worry about her friend's honesty.

Gold jewelry in a store in Thailand

