Ministry of Higher Education and Scientific Research
University Ferhat Abbas- Setif 1
Institut: Optics and mechanics of precision
Domain: Sciences and technologies
Sector: Optics and mechanics of precision
Specialty: Material Mechanics

End of study report

Theme: Thermal and topographical study of some phase transitions in the Au-50.wt% Cu and Au-15wt.% Cu-35wt. %Ag systems at low temperature.

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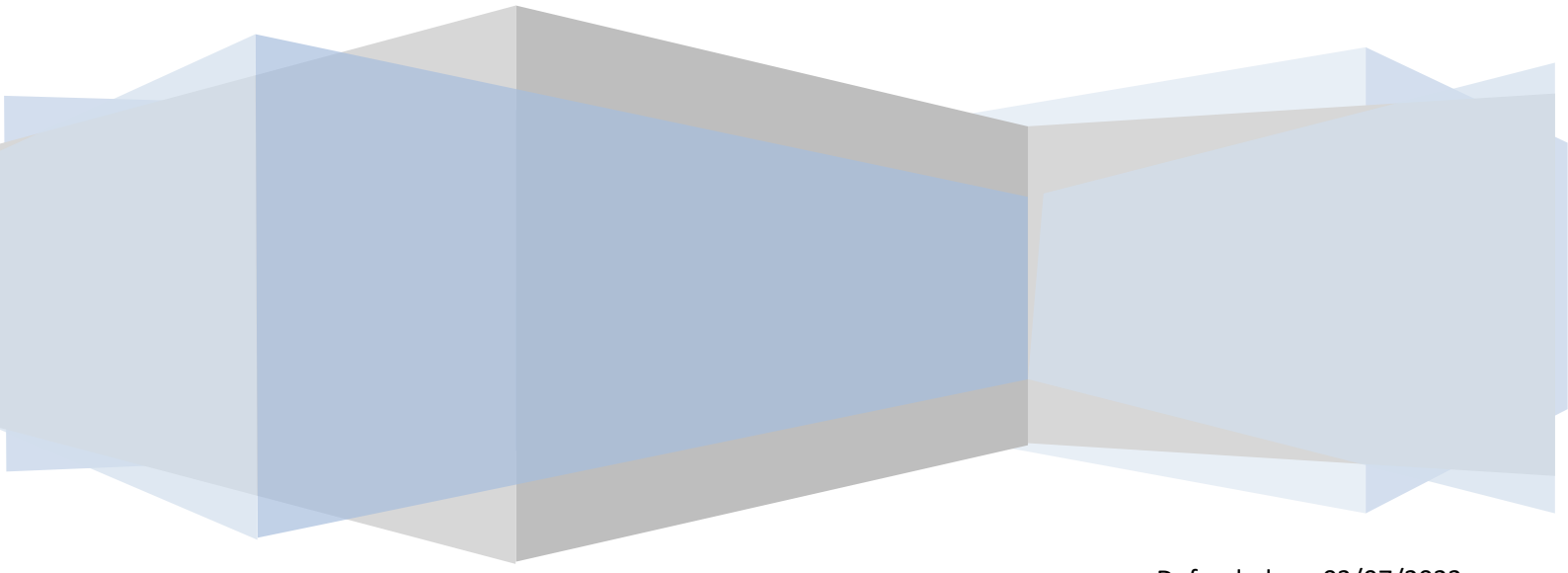

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Summary

Chapter II**:** Materials and Methods

Chapter III: Results and interpretaion

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For first, I would like to thank 'Allah' for giving me the granted health, power and the persistence to continue this work.

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Dedication

I dedicate this work to :

My amazing parents whose support me and being behind me from the first step till here.

My dear brother abdenour, my sisters wiam and amira.

My grandfather and grandmother,

For myself, to continue the way and did not give up .

My friends :

For the one and only ‘Maroua’ and also Imen.

Abstract

The gold-copper alloys are among the first investigated alloys in the humain history. The aim of this work is to study the new reaction in the binary and the ternary 12-carrat gold alloys at low temperature to determine the nature of some phase transition using X-ray diffraction (XRD) and thremal techniques which are differential scanning calorimetry (DSC) and differential dilatomerty. Furthermore, morphological techniques have been used like scanning electron microscopy (SEM) and scanning tunnel microscopy (STM). In addition to X-ray photon electron spectroscopy (XPS) ending by confirming it by grazing incidence X-ray diffraction. Finally, we confirmed the presence of such anomaly at low temperature and we found that it is probably about the precipitation of coper oxide nanoparticules at these low temperatures on sample surfaces.

Key words : 12-carrat gold alloys**,** new reaction, phase transition, DSC, differential dilatometry, SEM, STM, XPS, grazing incidence XRD, copper oxide.

Résumé

Les alliages Or-Cuivre sont parmi les premiers alliages étudiés dans l'histoire humaine. Le but de ce travail est d'étudier la nouvelle réaction dans les alliages binaires et ternaires d'or 12-carats à basse température pour déterminer la nature de certaines transitions de phase en utilisant la diffraction des rayon X (DRX) et les techniques thermiques qui sont la calorimétrie (DSC) et la dilatométrie. De plus, les techniques morphologiques ont été utilisées comme la microscopie électronique à balayage (SEM) et la microscopie à effet tunnel (STM). En fin l'XPS et la diffraction des rayons X en incidence rasante. En conclusion, nous avons confirmé la présence d'une telle anomalie à basse température et nous avons trouvé qu'elle s'agit probablement de la précipitation de nanoparticules d'oxyde de cuivre à ces basses températures sur les surfaces des échantillions.

Mots-clé : les alliages Or-Cuivre 12-carats, nouvelle réaction, transitions de phase, DSC, dilatométrie, SEM, STM, XPS, DRX en incidence rasante, oxide de cuivre.

ملخص

سبائك الذهب والنحاس هي من بين السبائك الأولى التي تمت دراستها في تاريخ البشرية. الهدف من هذا العمل هو دراسة التفاعل الجديد في السبائك الثنائية والثلاثية من الذهب عيار 12 قيراطًا عند درجة حرارة منخفضة لتحديد طبيعة انتقالات طور معينة باستخدام تقنيات حيود الأشعة السينية (XRD) والتقنيات الحرارية. وقياس التمدد. بالإضافة إلى ذلك ، تم استخدام التقنيات المورفولوجية مثل المسح المجهري الإلكتروني (SEM) والمسح المجهري النفقي (STM). أخيرًا ، XPS وحيود الأشعة السينية للرعي. في الختام ، أكدنا وجود مثل هذا الشذوذ في درجات حرارة منخفضة ووجدنا أنه ربما يكون ترسب جزيئات أكسيد النحاس النانوية في درجات الحرارة المنخفضة هذه على أسطح العينات

الكلمات المفتاحية: سبائك الذهب والنحاس عيار 12 قيراط ، تفاعل جديد ، انتقالات المرحلة ، DSC ، قياس التمدد ، SEM ، STM، XPS، XRD بزاوية صغيرة أكسيد النحاس.

General introduction

General introduction

Gold is a rare, bright yellow, unalterable metal. It is for these main qualities that gold is considered precious. These characteristics are what give it its title of noble metal. Gold has been one of the most appealing and sought-after elements of the periodic system. With its high corrosion resistance, it suggested itself as the base material or protective coating of works and ornaments created to stand the test of time. Its distinctive color stands out against the grayish monotony displayed by most metals (the only other exceptions being copper and cesium). These properties combined with its rarity qualify gold as a precious metal, a perception that to the casual observer is further reinforced by its high specific weight. The study of gold alloys continues to attract many researchers because of different questions asked around its equilibrium diagram. The mechanical study has also recently attracted a lot of interest since gold alloys have a big importance in jewelry and horology industry and for a new application: in electronics for its good conductivity and chemical positivity [1]

In physics of Materials, order-disorder transformation has been studied for a long time in different intermetallic systems [2]. Tamman in 1919 [3] has guess for the first time the existence of order; Bain in 1923 [4], Johansson et Linde en 1925 [4] have shown this transformation by X-ray diffraction (XRD). In 1934 Bragg and Williams described this transition observed in Cu-Zn alloys by the existence of a state in which groups of atoms are ordered in a crystal lattice [5]. Basing on the spectrum of XRD, they were able to show that below a certain temperature of transition the atoms are ordered on two different sub-lattices which interpenetrate [5].

A new pre-ordering reaction that precedes the ordering reaction in the equiatomic Au-Cu system occurs at low temperature, and it has been observed for the first time by Hamana et al [6]. Therefore, this work will be interested by the study of the presence of such reaction in the binary and the ternary 12-carat gold alloys. Thus, a binary (Au-50wt% .Cu) and a ternary (Au-15wt. %Cu-35wt. %Ag) compositions will be the subject of this study.

The report corresponds to three chapters, in addition to an introduction and a conclusion, the first chapter is a reminder on order-disorder transformations The influence of the order on physical prosperities of the alloys, defect in structures, Characteristics and ordering process in AuCu and AuCuAg systems.

The second chapter describes the experimental techniques we used during this study. The last chapter presents the different results obtained with their interpretations.