

Additive Manufacturing in Metal Jewelry Industry: Analytical Study

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Abstract:

With the diversity and multiplicity of materials used in the production of jewelry throughout history and the development of jewelry design in successive ages and decades, metal still the basic raw material for jewelry production. Moreover, modern raw materials been used as a supplement to add more variation in jewelry ores along with the metal or as an aid to the production of metal jewelry. Hence metal forming and working techniques remained the basis of jewelry production. Thus with every emergence of a modern production technology, the interest in the field of jewelry is the addition and support that these technologies provide for the production of precious and imitation metal jewelry.

Additive Manufacturing represents a productive revolution that penetrated all industrial fields with the advantages it provided, and these features brought about many changes in the form and nature of products and methods of manufacturing them. In the field of jewelry and fashion, the use of additive manufacturing techniques has grown and new trends in design have emerged unfamiliar in the form of jewelry. In addition, Jewelry has become an essential section of many global 3D printing service providers. We find with these trends a lot of freedom in dealing with raw materials in the production of jewelry. However, with what previously stated that the metal remains the main attraction and the main material in the production of jewelry in the wider sector of that industry, interest has grown in how to benefit from additive manufacturing techniques to enhancing the production of metallic jewelry and developing its production techniques in light of modern technical changes. Thus, additive manufacturing techniques have replaced some of the traditional techniques, and 3D printing techniques now used in the direct production of jewelry pieces. These different applications of additive manufacturing in the field of jewelry spread on an international scale in the United States of America and European countries where the production of manufacturing machines in addition to the diversity of their technologies prevail. These applications confined within the local scope of Egypt to the use of available technologies and thus many design practices and knowledge of all the gains achieved by that modern production revolution are absent. Hence, the interest in this research was to learn about additive manufacturing techniques, their applications and their role in the field of jewelry, especially the production of metal jewelry, the broader industrial sector in this field. The **research problem** is the scarcity of arabic studies related to the impact and applications of additive manufacturing to the field of jewelry, which calls for specialized research to benefit this field. Moreover, the humility of practical practice and benefit from additive manufacturing techniques to locally compared to the features it offers and entrances to the development of the metal jewelry industry achieved in many international brands. The **research aims** to identify the techniques of additive manufacturing used in the production of jewelry, with knowledge of its capabilities and applications in the production of metal jewelry, and to review what the field of jewelry has reached globally by benefiting from additive manufacturing techniques. The research importance lies in presenting a scientific study explaining the ways of producing metallic jewelry using additive manufacturing techniques to providing scholars and workers in the field of jewelry with knowledge of modern production techniques and their capabilities that serve the field. Through the **descriptive analytical approach**, the research concluded by highlighting what additive manufacturing techniques provided to the contributions to the production of metallic jewelry, and the areas of development and change that they brought about in the field.

Main Results: 1- Additive Manufacturing techniques provided a wide range of raw materials and capabilities that allowed them to contribute to the production of metallic jewelry in all stages of its direct or indirect production. 2- By analyzing, the designs produced using additive manufacturing; we find that its techniques did not replace the traditional techniques only. It also helped to develop them, as we see in the merging of more than one stage of jewelry production, where it became possible to produce jewelry consisting of more than one interconnected part with one production process without the need for a subsequent assembly process. It is also

possible to achieve surface appearances on the pieces of jewelry by applying different textures to the design on the computer, and there is no need after printing for any finishing process or adding texture. 3- Noting the volume of production available from jewelry made of metal directly with additive manufacturing techniques we find that the largest percentage of these jewelry are made of stainless steel. Thus, we find that traditional non-ferrous metals are no longer the only representative of metal jewelry, but iron ores are widely used with color treatments for other metals. 4- The production of jewelry, in addition to the use of traditional techniques, has not completely dispensed with, as these techniques remain important in adding more value to the piece of jewelry and the need for it to produce the final product in an aesthetically appropriate form. 5- The capabilities of designing products using the computer and printing them according to the required production volume or as desired, allows the fulfillment of the individual desires of the wearer in the form, material and final treatment of the piece of jewelry. 6- Additive manufacturing has increased richness and diversity to the design of metal jewelry, as its techniques allowed the implementation of what was not available by traditional methods, which gave the designers greater freedom for creativity, innovation and materially reap the benefits of their creativity.

Keywords :

Additive manufacturing, jewelry industry, jewelry design

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