

## Evaluation of the UV absorbance of sun skin lighting creams

Magdi Hassan Saad<sup>1, 2</sup>

1. Department of Physics, Faculty of Science, Taibah University - Yanbu Branch, KSA
2. Department of Physics, Sudan University of Science Technology, Khartoum, SUDAN

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**Abstract:** The results of studies conducted on some skin-lightening creams in the Saudi market indicated that they contain heavy metals in varying proportions that exceed the limits recommended by the World Health Organization, which may cause danger to human health. The study focused on three types of skin-lightening creams, namely Fair & Lovely, Rose, and Diana, to estimate their absorption percentages. In general, the results showed that the relationship between the absorbance rate of skin lightening creams and the wavelength is an inverse relationship, where the absorbance rate decreases with the increase in wavelength. For samples treated with ferment only for skin-lightening creams, the cream with the highest absorption value was Fair & Lovely cream, and the lowest absorption value was Rose cream. In addition, for untreated cream samples, Rose cream had the highest absorption, while Fair & Lovely cream recorded the lowest absorption value. In addition, the samples of creams to which olive oil was added only, without exposure to any other factors, had almost the same absorbance value. Moreover, the samples of creams that were exposed to sunlight varied in their absorbance values, as Rose cream recorded the highest absorption value and Fair & Lovely cream had the lowest absorption value. In the samples of creams that were exposed to X-rays, the results showed that the Diana cream sample and the Rose cream sample had the same pattern and behavior in absorbance. UV spectroscopy (Genesys 10S UV-Vis spectrophotometer) was used.

**Keywords:** Skin-lightening, Creams, Absorbance, Fair & lovely, Rose, Diana

## Introduction

Skin lightening for cosmetic reasons is associated with profound negative impacts effects on the skin. Hydroquinone-containing preparations may cause exogenous ochronosis, and paradoxical blue-gray hyperpigmentation due to the deposition of homogentisic acid in the skin, Fig. 1, a natural derivative of hydroquinone is  $\alpha$ -arbutin, a glycoside in whose structure the hydroquinone is bound to a D-glucose molecule Fig.2. For preparations containing mercury, systemic concerns may include neuropsychiatric toxicity and nephrotoxicity, as well as pneumonitis, nail depigmentation, and mercurial baboon syndrome.

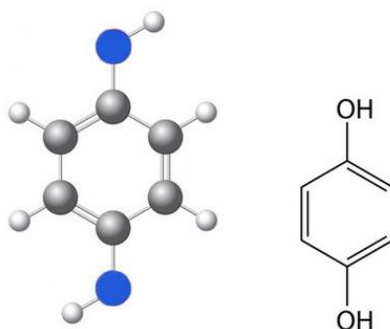
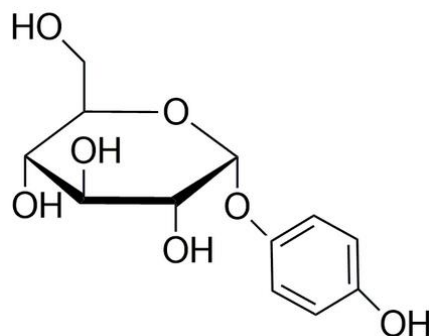


Fig.1: Hydroquinone structure



**Fig. 2: Arbutin structure**

Cosmetics have been known since ancient times, and they are materials that were found and invented to change and protect some of the external parts of the body, natural and industrial ones have been known, and they contain chemical compounds, and the basic materials and components for the cosmetics industry are water, emulsifiers, preservatives, thickeners, and moisturizers, colors, perfumes, and in our time, cosmetics are witnessing a huge wave, as they are considered one of the major business and commercial deals that benefit the pioneers very much. Since ancient times, cosmetics have been used in routine body care, which may contain toxic heavy metals. [1, 2].

Many people believe that skin allergies appear at birth, but this is not true. It may appear at any age if exposure to allergens occurs. Although most people are keen to buy well-known names in the market to ensure the quality of these companies and the quality of their products, this is not true. Also, because sensitizing materials can be present in any cosmetic product, regardless of its price and quality.

Allergies result from skin contact with a foreign substance, and it may be a chemical or natural substance (of plant or animal origin). The foreign substance enters the body's tissues directly through the skin, and the immune system recognizes and interacts with it to form immune antibodies to it.

These materials can be divided into two main parts: 1- Substances that cause allergies: such as perfumes, preservatives, and others, and often the person has been exposed to the substance for several periods previously. 2- Irritants to the skin include soap, cleaning agents, acids, glass cleaners, and even some fruits and vegetable peels! It can happen to anyone, and prior exposure to the substance is not required.

When applied to the skin, there is a possibility of exposure to a variety of toxic chemicals. [3-5].

A chemical substance has a fixed chemical composition and distinctive properties, and it cannot be separated into components by physical separation methods, that is, without breaking chemical bonds, and chemicals can be simple substances, chemical compounds, or alloys. Dangerous chemicals

Harmful ingredients can easily be hidden under confusing or deceptive headings such as "fragrance," and they may be listed easily and simply on the label, but consumers are unaware of their potentially harmful effects. If makeup is part of your daily routine, it is necessary to think about what you put on your skin, as it absorbs your skin is what you put on it. These chemicals have harmful health problems, such as mercury and lead [6-8], and their presence in skin care products is very dangerous, as they have the property of accumulating in the body after absorption. Heavy metals accumulate in the human body over time and over the course of his life, and this causes many health problems, including cancer, reproductive disorders, memory loss, nervousness, nerve disorders, joint and muscle problems, cardiovascular diseases, skeletal problems, Diseases of the immune system and kidneys, vomiting, nausea, brittle hair, and hair loss, and the accumulation of these minerals in the lung leads to damage. Not only is the body affected by what women swallow from lipstick by mouth, but the skin also absorbs these substances, especially wounded or peeled skin, and some studies by the US National Institutes of Health indicated that these minerals can appear later in urine. Likewise, a woman is not exposed when she beautifies one metal, but rather to different groups and endless possible combinations, other than the presence of these minerals in our daily lives. Arsenic, for example, is found in drinking water in some countries, and lead is present in old paint in low quantities, but it is accumulate over time. [9-11].

Health organizations believe the concentration of heavy metals in medicines should be controlled. But it is silent about the maximum permissible limits for heavy metals in cosmetics. In view of the importance of trace elements and the toxic effects of heavy metals in the formulations, and the fact that most scientific studies are conducted in this field, many skin creams have been studied, as studies have proven that they contain higher levels of these heavy elements than the recommended permissible limits such as mercury, cadmium, lead, and arsenic. [12-13].

In the skin is the melanin layer, which includes eumelanin and pheomelanin. The process of melanin formation takes place through enzymatic and chemical reactions. Melanocytes are found within cell organelles called melanosomes that travel through dendrites to the cytoplasm of neighboring keratinocytes, which in turn play an important role in photo protection by forming coverings over the nucleus in human epidermal cells, thus reducing the formation of photosynthetic DNA products due to exposure to ultraviolet radiation. [14-16]. When melanin is exposed to ultraviolet light, it is stimulated by a variety of factors, including cycle pyrimidine dimers, an alpha-melanocyte-stimulating factor, stem cell factor, and nitric oxide, an adrenocorticotrophic hormone, through various signaling pathways. Melanin production is mediated by stimulating DNA repair.

The skin-lightening process is done by using chemicals or any product that can remove or improve skin pigmentation, and this is done by reducing the concentration of melanin to decrease the skin's physiological pigmentation. [17].

### Sample and sample preparation

Three types of skin-lightening creams were chosen: Fair Indulgence, Rose, and Diana. 1 gram of each type of cream was weighed and face powder, foundation cream, saline solution (to represent perspiration), and makeup remover were added to it. These additives were estimated based on the questionnaire that was distributed to the girls, in addition to the aforementioned ingredients, which represent what the girls use. After the additions, each cream was divided into four groups, the first group was left as it is, the second group was irradiated with X-rays to represent rays of higher energy than the sun rays that the girl is exposed to, the third group was exposed to direct sunlight with an average time that was calculated based on the questionnaire. Based on the questionnaire, the fourth group was covered with a black cloth (Khimar) and placed under the sun for the same amount of time.

UV spectroscopy (Using Genesys 10S UV-Vis spectrophotometer) was used

### Results and Discussion

In general, the results showed that the relationship between the absorbance rate of skin lightening creams and the wavelength is an inverse relationship, where the absorbance rate decreases with the increase in wavelength. In Figure [1], we notice that there is a clear discrepancy in the absorbance of Fair & Lovely cream for the treated samples, as it is clear that the wine sample is the highest absorbance by 3.5au, and the sample treated with X-rays was the lowest absorbance by 2au.

From Figure [2] for Cream Rose samples, we notice that the initial value of the absorbance is almost equal, which is approximately equal to 3au for all treated samples, as it was observed that the longer the wavelength, the behavior of the samples becomes the same, and the value of the absorbance stabilizes in the value of 2au. As for Figure [3] of Diana cream, the sample treated with olive oil is the highest absorbance, which is 3.25au, and the sample treated with sunlight and the untreated sample have the same absorbance value, which is 2.5au.

For patients treated with ferment only for skin-lightening creams, the cream with the highest absorption value was Fair & Lovely cream at 3.5au, and the lowest absorption was Rose cream at 2.8au, while the absorption value for Dina cream was 3.2au. Figure [4]. With regard to untreated cream samples, Rose cream had the highest absorbency at 3au, while Fair & Lovely cream recorded the lowest value at 2.2au, and Diana cream had an absorbency of 2.5au. Figure [5]. In Figure [6], which is related to the results of cream samples with olive oil added only without exposure to any other factors, the absorbance value was approximately equal to 3au, and with increasing wavelength, the absorbance decreased to 2au. As for the cream samples that were exposed to sunlight, the absorbance values varied, as Rose cream recorded the highest absorbance value, which is 3au, and Fair & Lovely cream recorded the lowest absorbance value, 2au, while the absorbance value of Diana cream was 2.5au, Figure [7]. Cream samples that were exposed to X-rays showed The results for the Diana cream sample and the Rose cream sample have the same

pattern and behavior in the absorbance by 2.8au, and the Fair n Lovely cream sample has an average absorbance of 1.5au Figure [8].

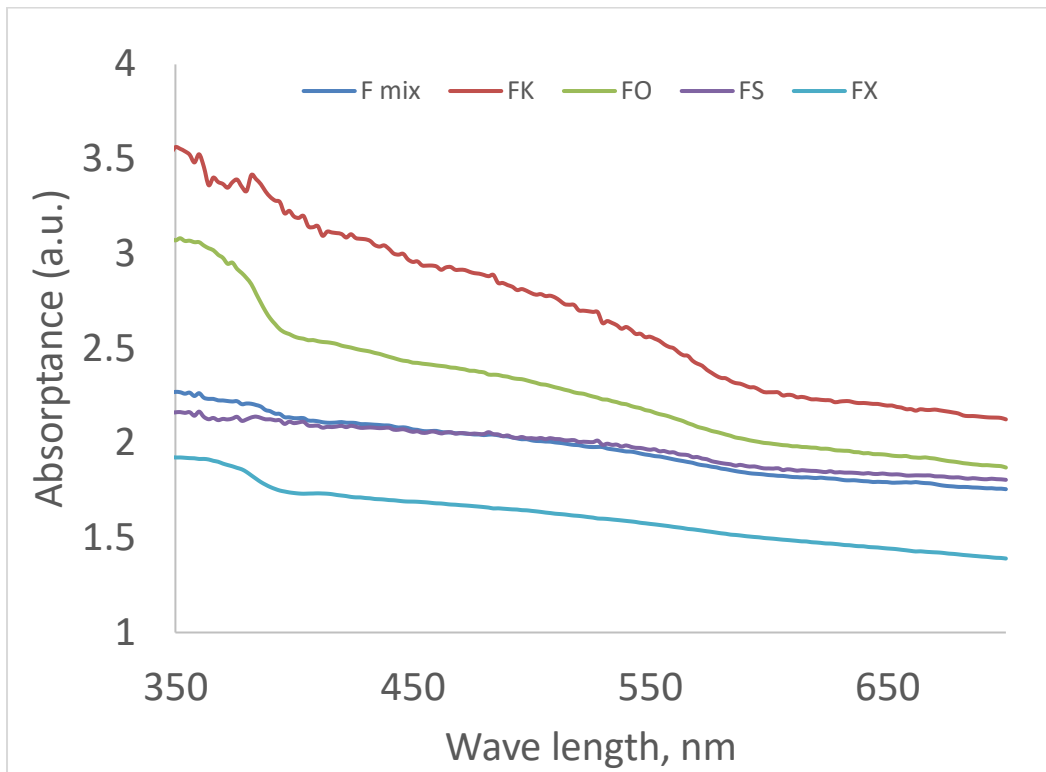


Fig. 1

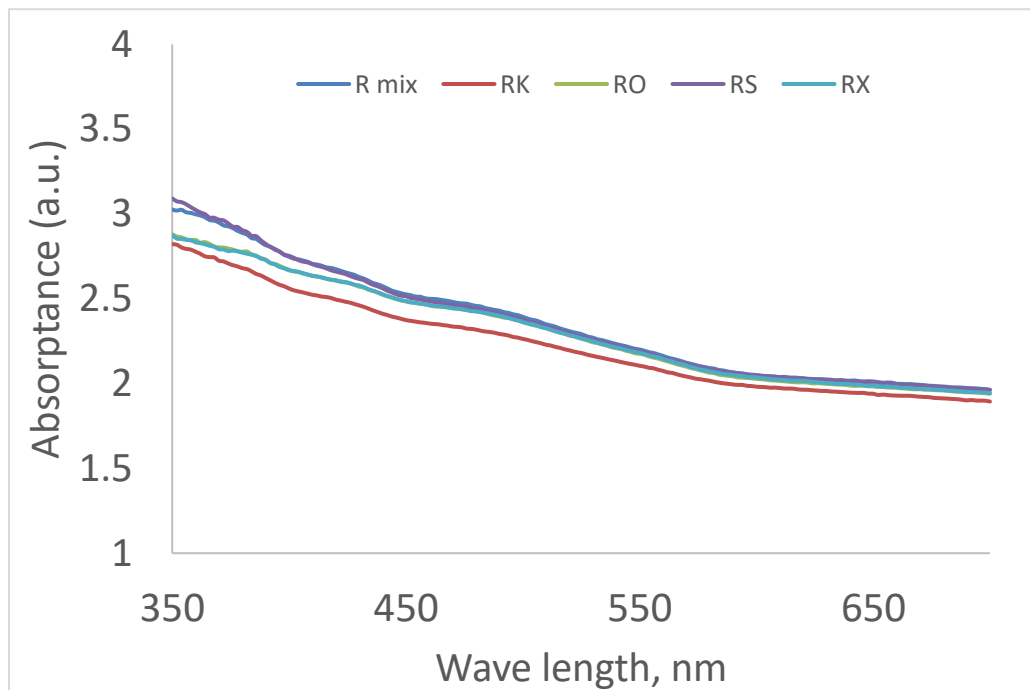


Fig. 2

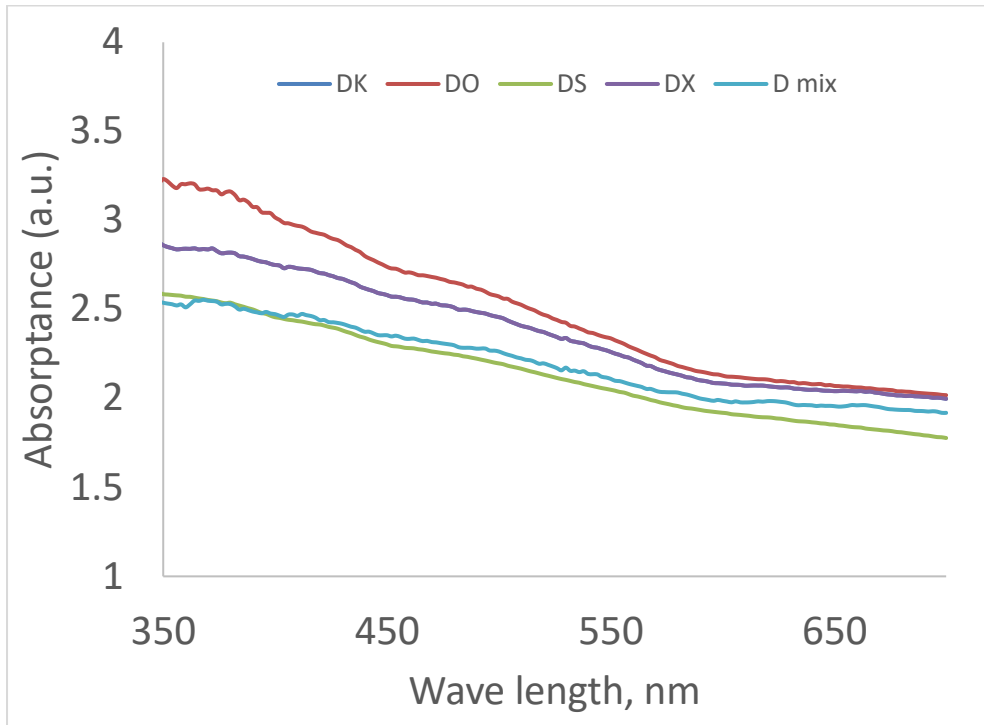


Fig. 3

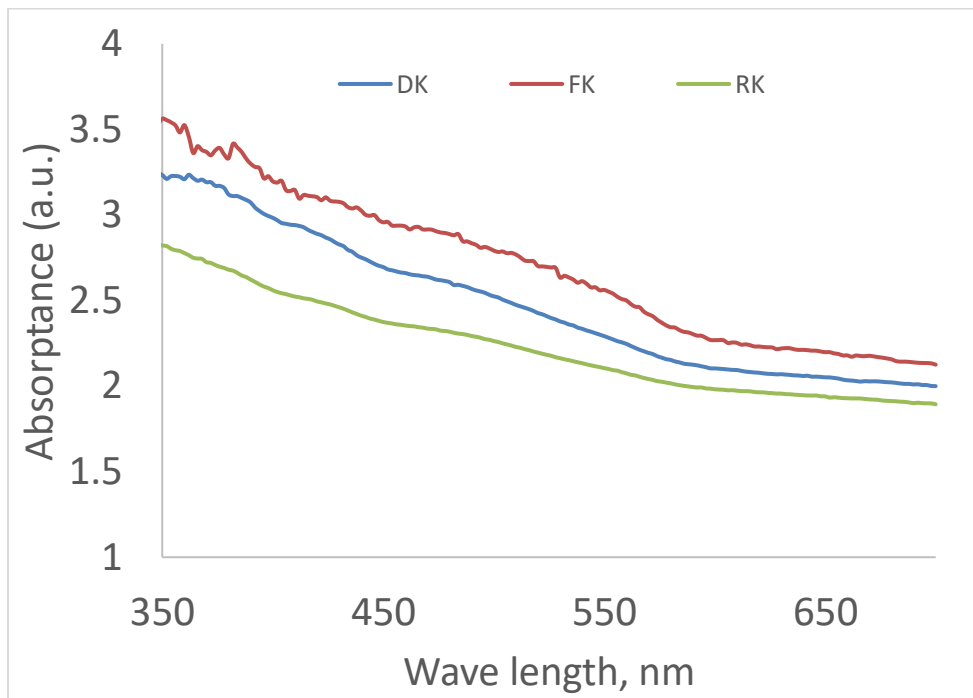


Fig. 4

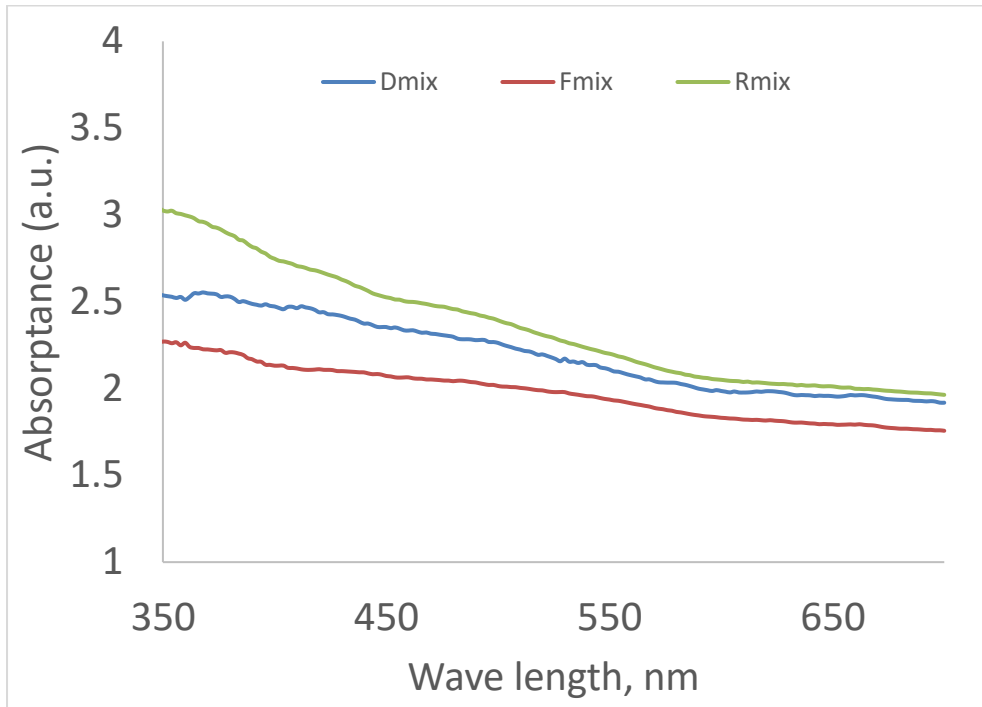


Fig. 5

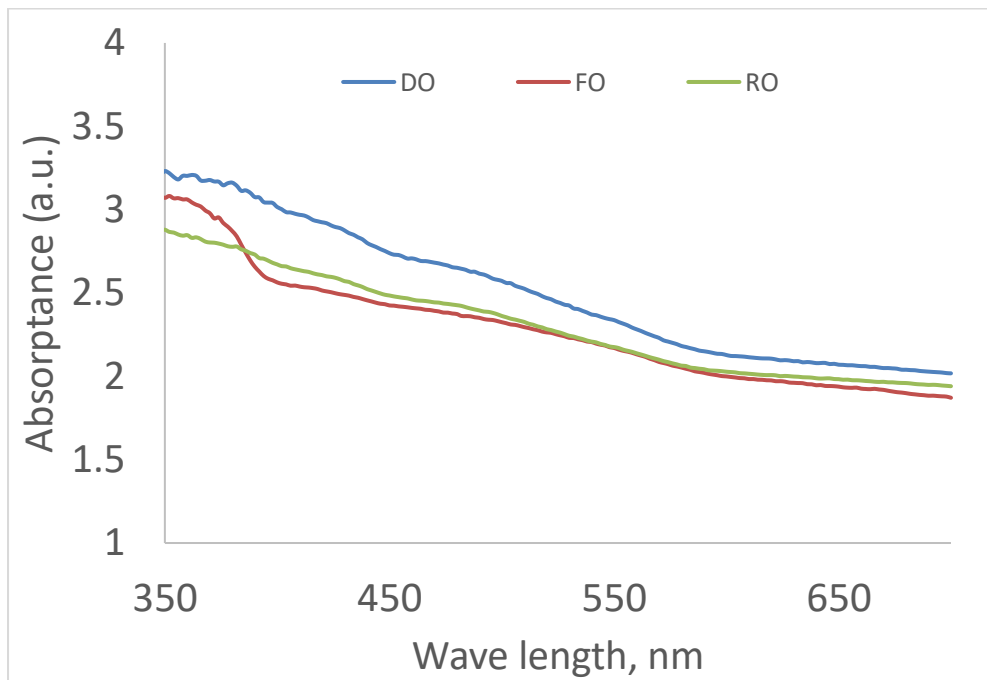


Fig. 6

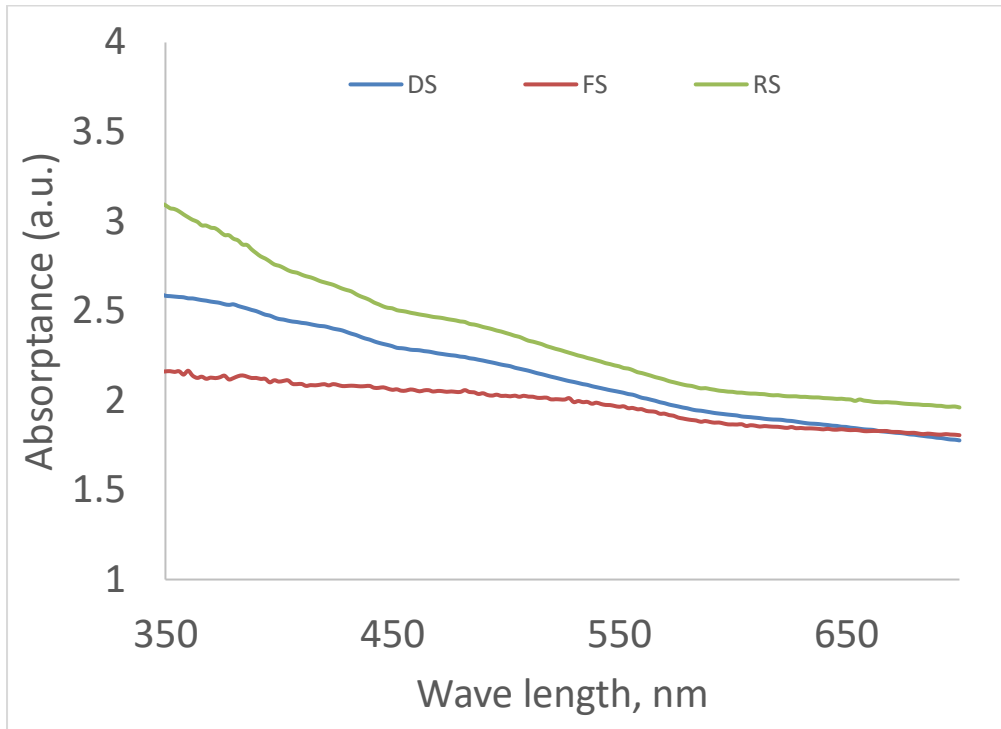


Fig. 7

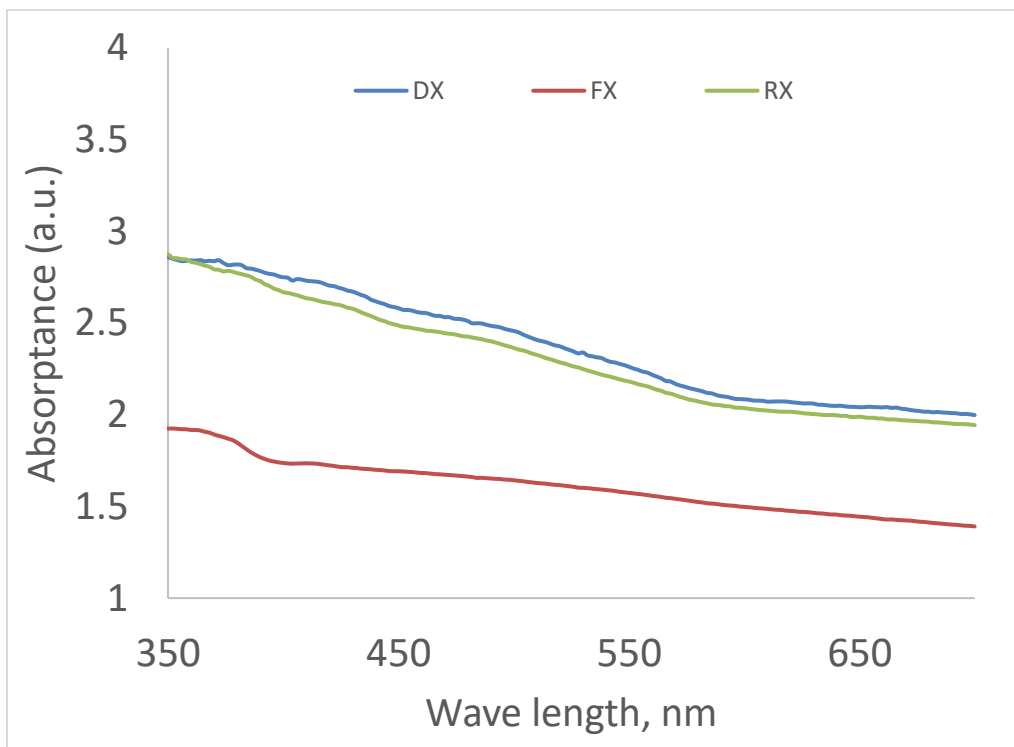


Fig. 8

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