



LILI'S NEW CHEM

COLOR IS A BEAUTIFULL THING. I KNOW, I KNOW¹

Today I would like to present one of my pigments based on alizarin and their derivatives such as alizarin red S.

I am delighted to show you my innovations around alizarin, the most important synthetic red colorant that was patented by Carl Graebe, Carl Liebermann and Heinrich Caro in Germany on 25 June 1869 and one day later by Sir William Henry Perkin² in England. Sir Perkin got a second patent in November of the same year for another process to produce alizarin. These colorants almost completely replaced the use of the natural red colorant from madder. You will see that the my novel alizarin metal complex, Alizcar GJ Violet³ has a violet/purple color that resembles the color of the the mauveine (or Perkin's mauve) colorant (Fig. 1), the first coal tar dyestuff which was serendipitously discovered by Sir Perkin in 1856. Perkin as a chemical engineer immediately thought about the scale-up processes for the manufacture and the application as a dyestuff. Although he was working in his lab as "all in one", he got help of a handful of grandiose partners, Pullar—with his historic reply encouraging him with his discovery—; Keith—the first silk dyer to use it in on industrial scale—; his family—father as financial support and brother as a architect and business expert—and his best friend—a chemist and adviser—to begin his endeavor in the chemical industry.

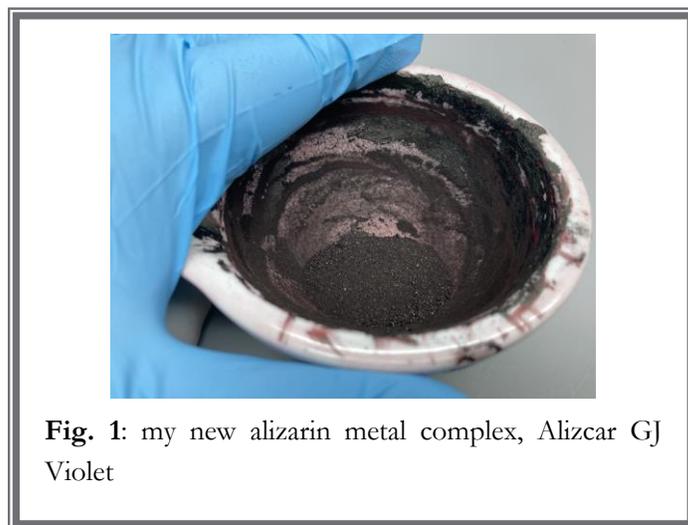


Fig. 1: my new alizarin metal complex, Alizcar GJ Violet

ON A NEW PIGMENT/DYE FROM ALIZARIN Alizar GJ Violet-C.I. Pigment Violet 63³

Alizarin—an anthraquinone or hydroxyanthraquinone bearing 2 hydroxyl groups in the 1 and 2 position of the aromatic ring— or alizarin derivatives are compounds that belong to the family of the polyphenols or phenolic compounds or aromatic anthroquinones which can be obtained synthetically or naturally from several plants such as madder (e.g., *rubia tintorum* or *rubia cordifolia* or *rubia peregrina*) in the form of a glycan (glycosides are joint to his structure). It is used as a red colorant for cosmetics, pharmaceuticals, textiles, and as staining dye. In addition, alizarin and his derivatives are used as potential drugs for treating cancer, as indicator, as a diagnostic aid and as an antibacterial.

Here, I would like to present my new pigment/dye based on the simple alizarin—no protecting groups nor leaving groups nor any other working groups⁴ are needed—or any of its derivatives e.g., alizarin red S (if desired) that it is very stable to light, storage, temperature, etc. (see Fig. 1). The way to produce this new pigment/dye is very simple, rapid and environment-friendly, since no organic or aqueous solvents are added and no waste or (toxic) byproducts

are produced. The process to produce my dyes is so simple and rapid that it might be well serve to visualize a chemical reaction to primary students like clicking or snapping your fingers: you can put literally the reactants between the fingers to perform a mechanochemical reaction. Occasionally some students join to my working group like Migue (Fig 2) and Tom. Just imagine that millions of tons of alizarin that are produced annually can be converted to a gorgeous violet pigment in only a few minutes with several applications for instance for replacing many toxic violet dyes containing toxic metals such as lead, arsenic or mercury.

This new alizarin colorant or the process to produce it can be used as a dye or hair dyeing technique such as the *in loco dyeing complexation* (see my patent applications WO/2021/121647 and WO/2019/238261 for more details and Fig. 3).

Alizar GJ Violet can be used as a violet colorant to avoid/replace the toxic violet dyes as mentioned above for instance, commonly used in conventional oxidative hair dyeing.

In addition, this new alizarin metal complex has a violet



Fig. 2: MACR “Migue” a high school student doing colorants/compounds from alizarin according to my innovations during a short stay in my lab.

color that resembles the color of aniline purple or mauveine colorant that was serendipitously discovered by Sir Perkin when he has a teenager in 1856 and for which he was forced to leave from the position as staff assistantship at College of Chemistry on Oxford Street due to his “industrial thinking”. However, his mentor took some inspiration from his former assistant and student and very quickly and subtly switched (or returned) to aniline research. Then, he studied and created/discovered compounds such as the Hofmann’s violet with arsenic acids that led directly into bankruptcy of some companies.

More than 160 years have passed since the beginning of modern organic chemistry. Now I can create colors by finger snapping.

This mechanochemical reaction using a finger snap can be used either to analyze the finger snap itself or the mechanochemical reaction that is involved.⁵

¡Un chasquido más, por favor!

‘SO GET A WITCHES SHAWL ON,
A BROOMSTICK YOU CAN CRAWL ON,
WE ‘RE GONNA PAY A CALL ON’⁶

I really believe that a spiritual man like Sir Perkin would have enjoyed my new creations when many others thought/think everything was already done on pigments and dyes.



Fig. 3: Control dog hair knots and dog hair knots after dyeing using *in loco hair dyeing complexation* technique with alizarin according to Lili’s new chemistry. Curly beige hair tresses were kindly donated by our adorable puppy.

¹ A beautiful song “Color it is a beautiful thing” by Nina Simone

² The history of the life and discovery of the Perkin’s dyes are well documented.

³ The Colour Index™ colour-index.com published online by Society of Dyers and Colourists and American Association of Textile Chemists and Colorist

⁴ My working group is only I, me and myself. Am I arrogant? Not, I am a scientific woman working in solitude!

⁵ Acharya R, Challita EJ, Ilton M, Saad Bhamla M. (2021). The ultrafast snap of a finger is mediated by skin friction. J. R. Soc. Interface 18: 20210672.

⁶ Part of The Adams Family theme song

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