

Topical *In Vivo* Liquid Catalase on Scalp and Migraine Headache Cessation in an Adolescent: A Biophysics Based Hypothesis

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Objective: The purpose of this manuscript is to introduce findings that when liquid topical catalase, which is an emitter of electromagnetic fields, was applied to selective scalp painful areas during migraine headaches the pain crisis subsided. A Biophysics based hypothesis is stated as the proposed factor for pain relief.

Background: The etiology of migraine headaches is unknown. The onset of a migraine episode varies; but usually starts in selective areas of the scalp with a localized painful condition. The human hair have been found to act as conduits for electromagnetic fields and documented to exit its energy in the direction of the shaft's cut ends and follicles. The ubiquitous enzyme catalase was also found to be a solo emitter of EMFs and to disrupt the intrinsic electromagnetic fields of both the hair shaft and follicle. These fields have been documented to penetrate glass barriers. Applied magnetism in the form of low-level EMFs has been found to alter nerve conduction.

Materials and Methodology: An 11 y/o white male adolescent suffering from chronic migraine headaches was exposed (during 3 sequential painful episodes) to topical liquid CAT. The solution was applied to selective areas of the scalp. One gram of CAT (20000 Units/Gram) in powder form was diluted in 5 ml of water. Two to three milliliters of the solution were warmed to body temperature (37°C) and then gently rubbed by fingertips to painful areas during migraine episodes.

Results: The ubiquitous enzyme catalase when in solution and applied to the scalp of a male adolescent migraineur during separate migraine (> one week apart) episodes (n=3) improved painful headache symptoms each time.

Conclusion: The ubiquitous enzyme catalase when in liquid form and applied to selective areas of the scalp, induces migraine headaches relief. A Biophysical mechanism is hypothesized.

Catalase | Migraine Relief | Electromagnetic Fields | Topical treatment | Neuromodulation | Electromagnetic Imaging

Introduction

The purpose of this manuscript is twofold, the first to introduce the analgesic effect of rubbing liquid catalase (CAT) solution *in vivo* to hairs and scalp of selective painful areas during three (n=3) separate migraine without aura episodes. The second is to also introduce a Biophysics hypothesis as the chosen mechanism (1). School children "with suspected migraine without aura not filling International Classification of Headache Disorders diagnostic criteria should be included in the treatment for migraine" (2). The case detailed in this manuscript fits that category; and is that of an 11 y/o adolescent diagnosed as suffering from migraine headaches. He was diagnosed at Miami Children Hospital. No preventative medications were prescribed. The adolescent is my grandson, and as such we provide after school childcare. After researching for contraindications, and due

to previous publications by the author, the ubiquitous enzyme CAT (3) was the substance of choice for this research. After obtaining consent from the mother and child's approval, diluted powder CAT was rubbed on painful areas of the scalp. Published observations (4,5,6) have documented the hair (shaft and follicle) as emitter of intrinsic electromagnetic fields (EMFs) that are able to penetrate glass barriers (7). The ubiquitous enzyme CAT is also included in the EMFs emitter category (8). Hairs are classified as functional external skin mini-organs with their own metabolic processes (9), as well as potential in drug delivery (10), as well as electromagnetic fields (EMFs) conduits (11). The dermis, as well as the hair follicle, "contains a network of blood capillaries, lymphatic vessels and nerve endings"(12,13). Based on the above facts there is support for a hypothesis linking the deliver of an EMFs emitting substance which could alter the dermis, hair shaft, and follicle nerve endings. This was theorized to influence the migraine process.

Materials and Methodology

Prussian Blue Stain (PBS) was prepared by using two parts of Potassium Ferrocyanide (Fe^2), one part HCl 2.5% and one part of a solution containing nanosized fine iron particles of a mean diameter of 2000 nanometers (2K). This mix is dubbed (PBS Fe^2 2K) (14).

Slide Assembly and detection of Catalase EMFs

A slide assembly was used to allow for the blocking of EMFs (emitted by CAT) (Fig 1). One 25x75x1mm slide was coated halfway with antimagnetic shielding black paint of up to 99% (Less EMR Inc. 4 OZ can) and allowed to dry. Freshly plucked *ex vivo* Human hairs were mounted on both sides of the painted slide, placed coverslips (24x50x1 mm), then covered by drops of PBS Fe^2 2K; and allowed to dry. Images recorded (Fig 2).

In vivo topical Catalase to painful scalp points

One gram of powder catalase 20000units/gram (Fisher Scientific CAS#9001-05-2) was diluted in 5 ml of water (4000units/ml). The diluted catalase (4000units/ml) was warmed in a water-bath to 37°C, then approximately 2 milliliters or 8000 units were rubbed over the painful right temporal area. Care was taken to protect the eyes from the liquid catalase. The same procedure was done to the left temporal area. After the data gathering stage, the skin areas were thoroughly washed with soap and water as indicated in the Catalase Safety Data Sheet.

Conflict of interest: No conflicts declared.

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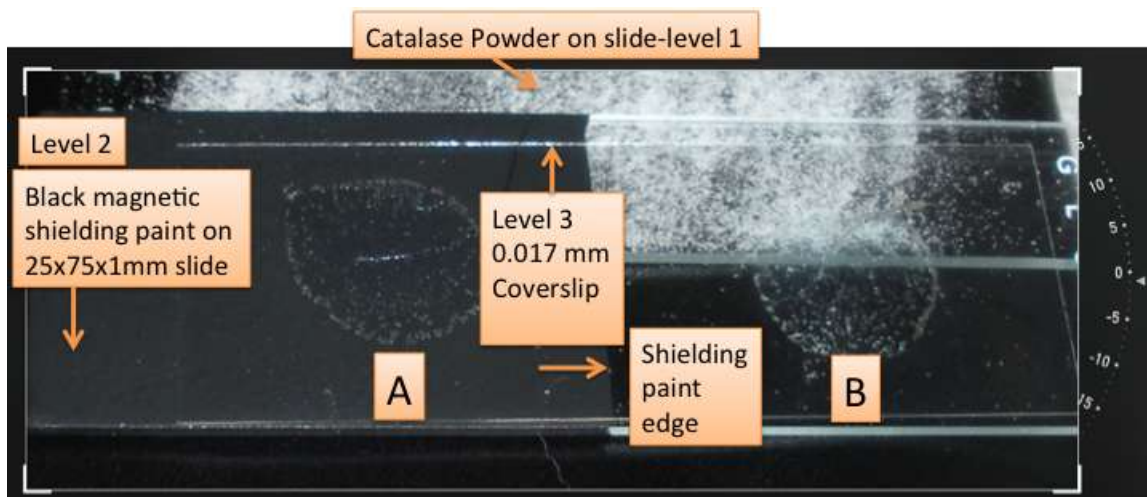


Figure 1. Slide assembly side A (with black magnetic paint) designed to shield Catalase Powder EMFs from vertically penetrating a 1 mm glass barrier. Side B control, allowing CAT EMFs to penetrate glass. Slide assembly level 1= Smeard catalase powder, level 2= Glass slide with black magnetic shielding paint, level 3= 0.017 mm thickness coverslip. A= Human Hair SSP PBS Fe² 2K on coverslip. This part of the coverslip is shielded by the black antimagnetic paint. B= Human Hair SSP PBS Fe² 2K on same coverslip. This part of coverslip is not shielded by the antimagnetic paint. Note: Levels 2 and 3 have been manually separated (shifted downward 3 mm) for demonstration purposes.

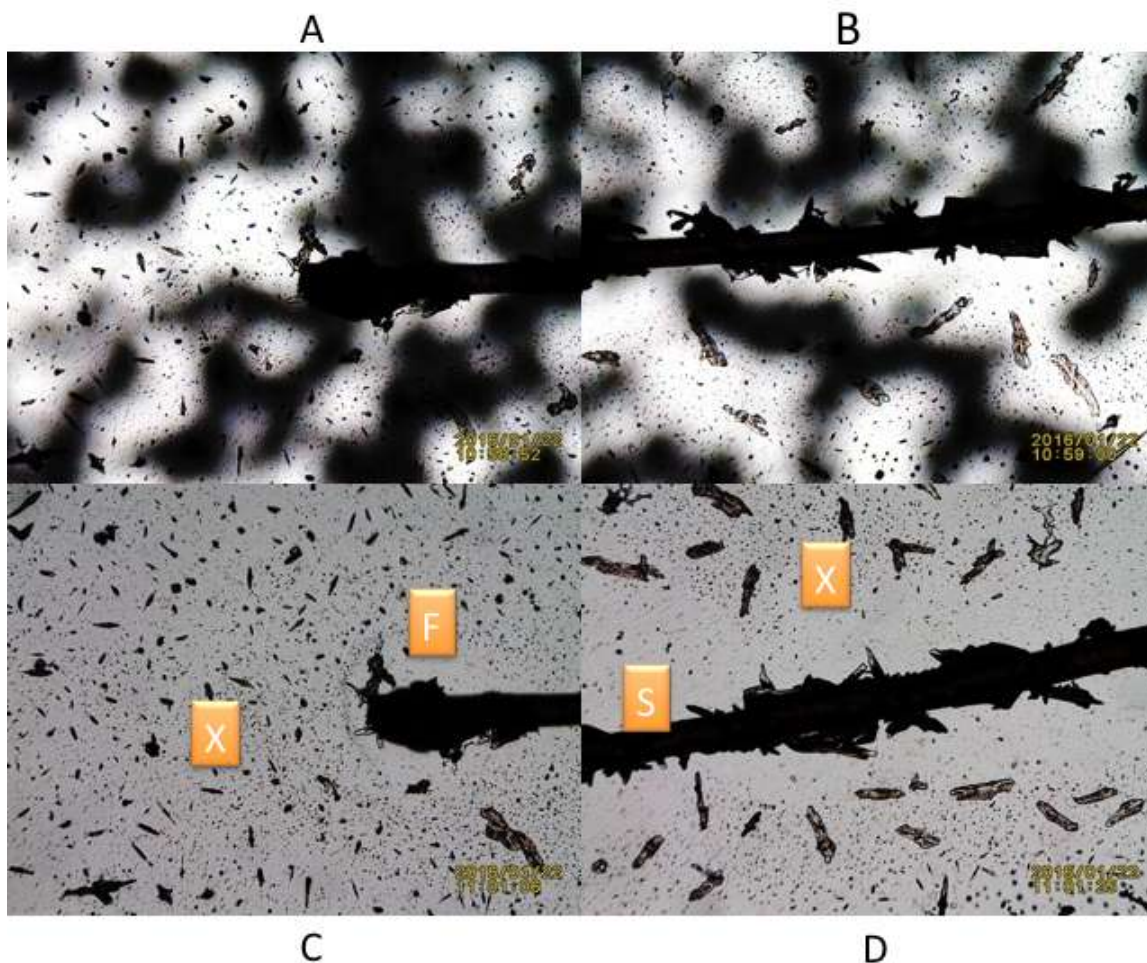


Figure 2. Panel shows two 25x75x1mm slides trapping catalase crystals. On top slide a human scalp hair was covered with PBS Fe² 2K solution and allowed to evaporate. Panels A and B showing the hair follicle and shaft over the catalase crystals (seen out of focus) separated by a 1 mm glass barrier. In Panel C, X= Disrupted magnetic field F= Hair follicle. In Panel D, S= Hair shaft and X= disrupted magnetic field. In panels C and D, the reversed side of top slide was wiped clean in order to display the hairs in detail. Please compare with Figures 1 and 2 showing the disruption in crystals arrangements around follicle and shaft caused by the CAT EMFs penetrating a 1 mm glass barrier.



Figure 3. Results from level 3 in n=2 of slide assembly experiments shown in Figure 5. Human hairs covered by liquid PBS $\text{Fe}^{2+} 2\text{K}$ and allowed to evaporate. Panel A: X= shows large crystals of Potassium Ferrocyanide. The black magnetic paint blocked the CAT EMFs. In panel B: X= Notice how the absence of a magnetic shield allowed for the CAT EMFs to disrupt the EMFs surrounding the follicle.

Recording equipment

After evaporation, images were viewed and recorded in the normal mode (no filters) x10 and x40 magnifications. Equipment used was a video-microscope (Celestron LCD Digital Microscope II model #44341, Torrance, California, USA). All pictures downloaded and labeled by using an Apple Inc. iPhoto 8.1.2, App.

Results

During 3 sequential migraine headaches episodes the pain intensities were mitigated. As per annotations, the 11 y/o adolescent episodes are described as follows:

1st Episode (Jan 25th 2017)

The child presented with a recurrent migraine without aura episode described as a level 8 on a 10-scale. The headache had started in school 2 hours prior to his arrival to my home. The warm liquid CAT solution was applied as per described in the methods section. In a matter of 3 minutes, the pain had subsided to a level 1 on a 10-scale. The child was questioned every 5 minutes as to any discomfort. One hour and 38 minutes later the pain returned at the initial level 8-10 scale. The original procedure was repeated. The second time, 4 minutes later the pain had subsided... now at a level 5. The pain continued to subside and 3 minutes later was at level 1. Approximately 1 hour later the headache was gone. When asked: How do you feel? The answer was "good, really good!"

2nd Episode (Jan 31st 2017)

Six days later, upon his arrival from school, the adolescent was complaining of a level 5 on a 10-scale migraine headache. This time he complained of allodynia in the left temporal area and pain in the right temple. The liquid catalase was applied as in the first episode. This time the pain rapidly subsided to a level 1 within 2 minutes. The only complain was a sensation of itchiness in the allodynia area. The itchiness subsided within 10 minutes.

3rd Episode (Feb 7th 2017)

Seven days post last episode, upon his arrival from school, the adolescent complained of a level 6-migraine headache. He stated that the headache has started the night before and now at 3:12 pm was a level 6 that had (in the last minute) switched positions from the right to the left side of the head. Asked me to help him to ease the pain since he had a heavy homework load. Applied the CAT solution as before to the painful area. The pain subsided from a 6 to a zero on a 10-scale in one minute.

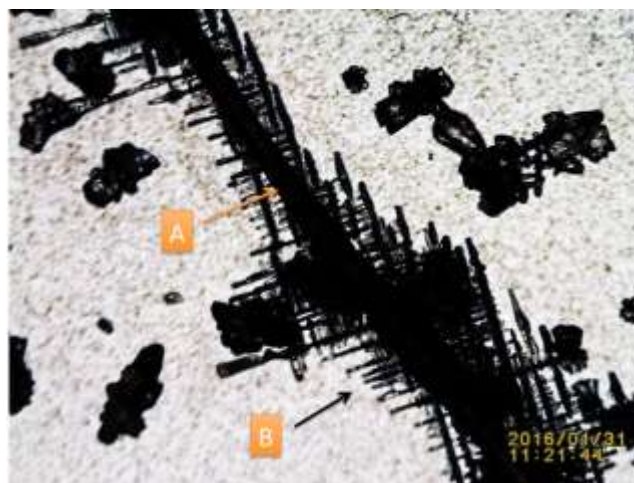


Figure 4. Hair shaft in separate experiment (n=4) notice the increased magnetic imprint of the hair shaft disrupted by catalase EMFs on the PBS $\text{Fe}^{2+} 2\text{K}$ after evaporation. Catalase residue was wiped clean from under the top slide for picture clarity - No magnetic shielding. A= Hair shaft B= Numerous Needles crystals around shaft. Notice loss of diamagnetism (repulsion of diamagnetic crystals) by the shaft. Please compare with control shaft.

Discussion

A literature search showed attempts to treat migraines by electromagnetism dated back to 1889. After 3 months of 34

treatments with static electricity the migraine headaches had subsided (15). Recently, research also shows Low level EMFs as neuromodulator by slowing nerve conduction (16,17). In humans it was demonstrated *in vitro* that he hair shaft EMFs emissions are affected by intrinsic EMFs emitted by Catalase (Figs 3,4). It is then hypothesized that the positive results in pain mitigation observed in the migraineur adolescent (n=3), could be as result of:

- a) The power of suggestion, placebo studies not done:
In this case, placebo studies were avoided due to their complexity (18).
- b) The antioxidant effect caused by the liquid catalase:
The regional antioxidant effect of catalase could be excluded as an option since there was a lack of bubbling on the hair or scalp. This denotes an absence of H₂O₂ breakdown. Furthermore, catalase is a large macromolecule with a 240,000 molecular weight; only small molecules of nanoparticles size are able to penetrate the skin (19); and
- c) Catalase as a Biophysical Neuromodulator:
The preferred option, based on the facts presented is the concept of Neuromodulation (20) caused by catalase EMFs. Endogenous EMFs emitted during cell respiration (21,22,23) has been proposed to be a factor in disease genesis. In the case of migraine headaches, the enzyme catalase caused the hair (shaft and follicle) to alter their diamagnetic properties. This is proposed to be a factor in the interruption of pain due to regional neuromodulation.

Control Slides vs Catalase EMFs effect

Visual display of iron laden crystals of potassium Ferrocyanide are appreciated: By the follicle in Figure 5; and the shaft in Figure 6. To aid the reader, compare Fig 5 with Fig 3 panel B. In the control slide, the follicle repels the diamagnetic crystals, in Fig 3 as result of the catalase effect, the diamagnetism is absent. Also please compare Fig 6 with Fig 4. The normal diamagnetic display is also absent in Fig 4. Additional slides showing bidirectional discharges of EMFs by the hair follicle and shaft are seen in Figs 7,8,9 and 10.

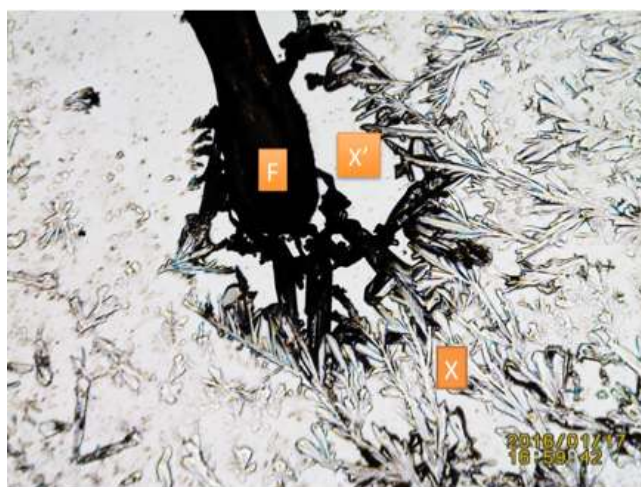


Figure 5. n=8 experiment. Control human hair in SSP PBS Fe² 2K after evaporation. This microphotograph depicts the arrangements of crystals of the diamagnetic Potassium Ferrocyanide surrounding the hair follicle. This image is typical of controls experiments utilizing Prussian Blue Stain mixed with small iron particles. F= Follicle X= Ferrocyanide crystals. X'= Empty area due to diamagnetism.



Figure 6. Control Hair shaft. n= 10. Image also typical of control experiments. Hair shaft segment after evaporation of PBS Fe² 4K showing Ferrocyanide crystals (resembling a shepherd's hook) surrounding the shaft. S= Hair shaft segment X= Crystals separated by diamagnetic forces and X'= Iron nanoparticles mixing with Ferrocyanide crystals.

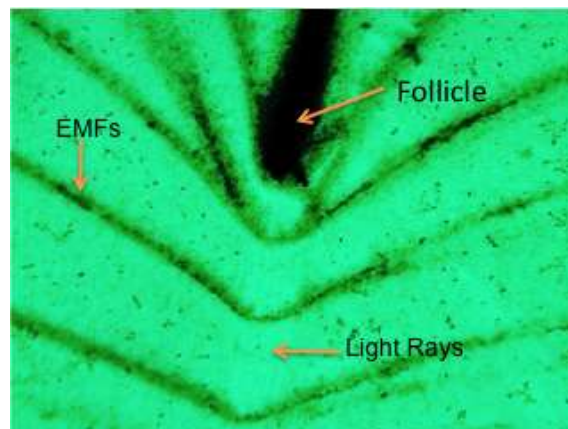


Figure 7. Control human hair Follicle of non-migraine sufferer in SDW of PBS Fe² 2K after evaporation. Showing cut hair follicle emitting EMFs expressed as Light Rays and delineated by iron particles accumulation in the Prussian Blue + iron solution.

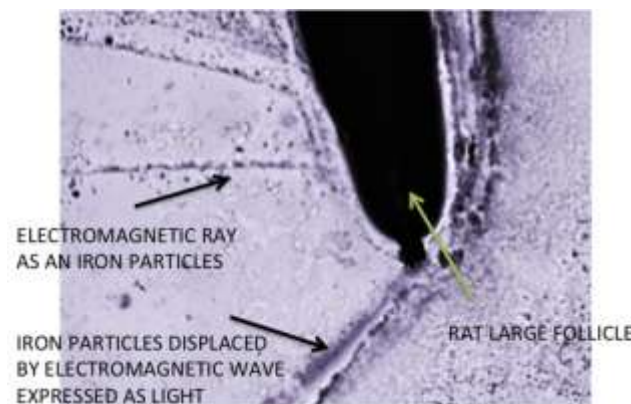


Figure 8. Rodent Follicle mounted in a SDW PBS Fe² 2K and allowed to evaporate. This image is post provocative air puffs (mimicking vibrations). Showing EMFs energy expressed as a light ray traveling beyond the hair follicle tip (Dermal Papilla Area) and displacing the aggregated iron particles. Figure Reprinted from Embi AA, Jacobson JJ, Sahoo K, Scherlag BJ (2015) Demonstration of Electromagnetic Energy Emanating from Isolated Rodent Whiskers and the Response to Intermittent Vibrations. JNSCI 1(3):e52.

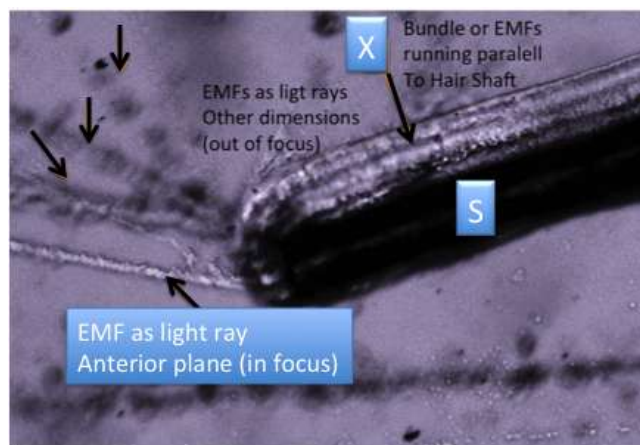


Figure 9. Electromagnetic Field dissipation at cut end of human hair shaft. Migraneur's hair sample in SDW PBS Fe² 2K; this time showing: S= Hair Shaft. Black arrows pointing at electromagnetic discharges in multidimensional planes. X= Bundled energy expressed as light adhering to one side of hair shaft.

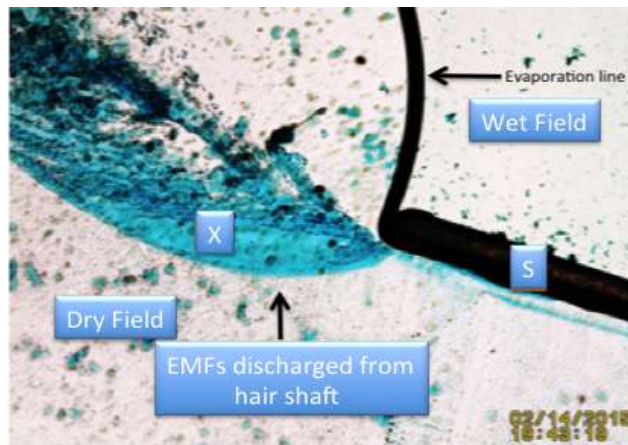


Figure 10. Depicts human hair shaft from adolescent migraineur in SDW of PBS Fe² 2K. S= Cut hair shaft X= Potassium Ferrocyanide crystals + iron particles that are stained blue by the Prussian blue stain. This image is after evaporation outlining EMF energy discharge.

Conclusions

Topical application of catalase to the scalp in an adolescent migraineur lowered the pain level in three different occasions. The slides presented denote the disruption or effect from EMFs emitted by the enzyme catalase on the hair structures. Also shown is the property of bidirectional discharges of EMFs from both the follicle and shaft. The mechanism for pain reduction is unknown at present. It is hypothesized that regional changes in the EMFs dynamics could be a factor in neuromodulation, Biophysics could play a role in the observed pain relief.

List of Terms

Biophysics = Electromagnetic fields interaction in Biology; CAT = Protein enzyme catalase; Diamagnetism = Property of all materials opposing applied magnetic fields; Dispositional Optimism = Generalized outcome expectancy that good things will happen; EMFs = Electromagnetic Fields; H₂O₂ = Hydrogen Peroxide; Nanometer = Unit Measurement. 1 millionth of a meter PBS = Prussian Blue Stain; Fe² = Ferrocyanide 2K= 2000 nanometers; SDW = "Sandwich". Matter placed between two glass slides; SSP = Matter on glass slide exposed to air; ie: preparation of drops of Prussian Blue Stain mixed with small iron particles (2000 nanometers in diameter)

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