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Materials of Fashion

From Analogue Principles to Hybrid Practices

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Material as a Hybrid Experiment

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Short Bio of the author: Carolin Pertsch is doing her doctorate at the Georg-August University of Göttingen in the Process Engineering of Composites group in cooperation with the Offenbach University of Art and Design (HfG Offenbach). As an expert in material driven design, Pertsch works between disciplines as a designer and scientist and develops new ideas as well as innovative concepts for possible application scenarios for ecological composite materials based on starch-containing plastics. She studied integrated design at the University of the Arts Bremen.

Materials take a crucial role in design, one that only grows in our ever changing and evolving material world today. The awareness for materials in the design process has never been as intense as in our day and age, as designers focus on exploring them in playful and experimental ways. They base their designs on specific materials and their engagement with materials stirs creative interactions and serves as a launching pad of design work. As new approaches and methods for design focussed on materials emerge, new research on the transformation of the role of materials in design follows suite, such as Elvin Karana on "Material Driven Design"[01], Valentina Rognoli on "DIY Materials"[02] or Markus Holzbachs on "Design with Designed Materials"[03]. These contributions to the field demonstrate that there are indeed new approaches on design emerging that are focussed on materials and endeavour to better understand, examine and design them. It is important to note that an approach to design that puts materials front and center does in fact turn the conventional approach to design on its' head: Design work now does not aim at developing a finished product anymore, thereby placing materials in a secondary role as a mere means to an pre-set goal. New approaches instead center an intense engagement with materials as they exist and strive to discover their inherent qualities and potentials in an experimental exploration. Seen in this context, the remarks by Anni Albers in 1938 seem to be more topical than ever before: "If we want to get from material the sense of directness, the adventure of being close to the stuff the world is made of, we have to go back to the material itself, to its original state, and from there on partake in its stage of change."[04] As design focusses on materials, processes dealing with materials, that transcend disciplines, assume a growing importance. These interfaces offer new challenges that go beyond established boundaries. They also produce synergies and complex design concepts in the experimental engagement with materiality, that generate new, material impulses for designers.

Traditionally, new and innovative development work in materials had mostly been located in industry or in academia, such as the natural and material sciences. But for some time now a playful-experimental interest in creating new materials and experimental research on materials could be observed in design. Designers act as developers of new materials and production processes more and more.

01 Karana, Elvin, Barati, Bahareh, Ragnoli, Valentina, Zeeuw van der Laan, Anouk: "Material Driven Design (MDD): A Method to Design for Material Experiences", International Journal of Design Vol 9 No. 2, 2015, p. 35-54.

02 Rognoli, Valentina, Bianchini, Massimo, Maffei, Stefano, Karana, Elvin: "DIY Materials", Materials and Design 86, 2015, p. 692-702.

03 Holzbach, Markus: "Gestalten mit gestalteten Materialien", Bauwelt 20, 2015, p. 26.

04 Albers, Anni: "Work with Material", Black Mountain College Bulletin, No. 5, November 1938.

The turn towards a singular focus on materials is driven by the intention to break out from the restrictions posed on design work by pre-existing materials that had been furnished by industrial production. Instead, designers now aspire to put their imprimatur on materials as they are being created and thereby take charge of development processes at the very outset. Be it alone or as a research collective across different disciplines, designers implement approaches from research into their own process of materialisation. According to Sascha Peters, "...creative professionals will evolve from roles as implementers focussed on applications to people engaging in conceptual arguments. They are turning into thought leaders on alternative options who in their engagement with producers suggest new materials or manufacturing processes – or develop these by themselves."[05]

Experiments with materials had a crucial importance already for the historical Bauhaus. The school based their design processes on materials in a methodological fashion. Their teaching, practical education and pedagogical approach – that grew out of the best traditions of progressive "reform education" of the 19th century – treated an intense engagement with specific materials and probing their meaning and the processes to utilise them as essential elements. In this context, the "Vorkurs" (their basic, introductory curriculum) played an important role by foregrounding materials as a sensual experience when it came to developing designs. Two leading figures at the Bauhaus, Johannes Itten and László Moholy-Nagy, emphasised the importance of sensual explorations and practical manipulations as means to develop an understanding of materials. They also encouraged the implementation of experiences based on materials in further steps of design processes. In his program of a comprehensive education, Itten considered training the tactical sense as important as sharpening the visual sense. To achieve this, he prescribed "material studies", where students explored materials and contrasts. These were understood as sensory contrasts such as those between smooth and rough, soft and hard, as well as between light and heavy. These were studied by engaging with materials, where students had to feel contrasts (tactile sense) and not just perceive these differences with their eyes (visual sense). By basing their approach on contrasts, the Bauhaus enabled students to explore essential characteristics of materiality and color by a direct engagement and with their senses. This holistic education steered the focus away from manufacturing finished products and instead foregrounded the relationship between humans and materials, according to Itten: "Some might only then fully believe in the validity

05 Peters, Sascha: "Materialien einer neuen Designkultur", in: Petra Eisele, Bernhard E. Bürdek (Hrsg.): "Design, Anfang des 21. Jh. Diskurse und Perspektiven", Ludwigsburg, avedition GmbH, 2011, p. 200-2011, here: p. 205.

of such exercises, if one tells them about the practical applications. [...] but this is much less important than the fundamental relationship of humans to materials, that in any given case can have fruitful effects on achieving a task."[06].

Looking at design academies today, that often times are at the vanguard of experimentation, probing and research, one can clearly perceive the development of a trend in design away from an orientation on products towards an approach oriented on materials. Design processes oriented towards products foreground sketching and visualising ideas for products. But these are more and more being left behind.

Creating designs oriented on materials and substances as spaces for explorations and playfulness has been become the focus of research and teaching in recent years. In addition to classic workshops for traditional materials such as wood, metals and ceramics, or those for additive manufacturing using new methods and technologies, workplaces that very much look like laboratories can be found, featuring sterile utensils and clean rooms for working in a controlled environment. Humidity chambers to breed and store samples under controlled levels of humidity and temperatures also facilitate the experimental engagement with and the development of new materials. Microorganisms such as bacteria, algae or fungi, that until recent years hardly figured in design, now have found new homes in the Petri dishes at design academies. These are turning into laboratories for material experiments where design methods oriented towards substance matter facilitate and support an experimental engagements with materiality.

Even there, traditional substances, that encounter new impulses of materialisation by undergoing additive manufacturing processes, encounter visions of mostly unexplored and unconventional matter with a set of characteristics that wait to be explored. The combination of high tech- and low tech-strategies results in new, hybrid forms. The interaction of analogue and digital processes to create shapes and materialisations for the creation of three-dimensionality opens up new spaces to explore possibilities of engagement with materiality. In many cases, these endeavours mean to probe feasibility, but they also try to break open conventions of design work in fundamental ways[07].

06 Moholy-Nagy, László: "Von Material zu Architektur". Mainz, Florian Kupferberg Verlag 1968. p. 57.

07 See: Holzbach, Markus: "Fragen an Markus Holzbach, HfG Offenbach", in: Markus Holzbach, Georg-Christof Bertsch, Material Grove: "Von traditionellen Materialien zu zukunftsorientierten Materialentwicklungen", published by: Präsident der Hochschule für Gestaltung. Offenbach am Main, 2014, p. 12-17, here p. 13.

Generating an end-result or a specific application by no means are the focus. Rather, such efforts foreground direct contact, the physical engagement with matter-as-such, with hands-on-experiments resulting in a new sensibility for materiality and a re-analogisation. What is at stake here, is "getting a grip" on materiality in an intellectual and practical sense, as proposed by Otl Aicher, who in his essay "greifen und begreifen" speaks about "apprehending" and "comprehending" things.[08]

The methodology of academic design with a focus on materials can be described as "research-by-design work". This approach is experimental with a strong tilt towards research and based in professional practices in engaging with materials, thereby tapping new knowledge and new contexts of knowledge that then lead to expanded approaches and methods in design oriented towards materials. Beyond specific interactions with materials, positions and visions on substances are being developed that can result in a public discourse and stir further debates in the context of materials, as well as evoke new issues in research. This expanded direction in teaching and researching at design academies transcends disciplines and provides a clear statement and a positioning towards further work in the material context in the sense outlined here.

Therefore the "blindness for materials", that Reiner Schönhammer ascribed to industrial design in 2001, seems to be a thing of the past for good now. Schönhammer had criticised an "universalist approach to design lacking any substance" as the result of an education in industrial design had grown estranged from materials[09].

Today, materials are situated in complex contexts that facilitate, but also call for new cross connections and interfaces with adjacent fields of knowledge such as technology, as well as natural or material science, that had heretofore hardly been related to design. There had been a longstanding attitude to regard individual fields as isolated islands. But in the course of the last decade we could witness a growing appreciation for how essential and productive an interaction between disciplines that were seemingly far apart from each other can be – and how crucial this is to face current challenges. New impulses for materialisation now emerge exactly at those interfaces that in turn stir the debate on disciplinarity, inter- and transdisciplinarity in design anew.

08 See: Aicher, Otl: "greifen und begreifen", in: "greifen und griffe", Franz Schneider, Brakel, 1987.

09 See: Schönhammer, Rainer: "Haptische Wahrnehmung und Design", in: Martin Grunwald u. Lothar Beyer: "Der bewegte Sinn. Grundlagen und Anwendungen zur haptischen Wahrnehmung". Basel et al.: Birkhäuser 2001. p. 151.

In the context of design processes oriented on materials, the engagement reaching beyond disciplines turns substances into a hybrid medium for research that produces new and unexpected material impulses by applying hybrid processes of materialisation between the poles of analogue and digital, as well as between the conventional and the unconventional. These impulses include a fusion of different disciplines that dissolves the borders among them to such an extent that they are hardly noticeable anymore. The rigid framework of substances is being consciously broken up and traditional ways to categorise materials are being challenged. To quote Sabine Kraft: "The relationship between form and substance has become as varied as it has become ambiguous. A recourse on clear rules and premises on what can be conceptualised and constructed in which materials and what kind of aesthetic message could be transported in that way, is hardly possible anymore – if it ever had been."[10] This fact is posing numerous challenges to collections and archives for materials and demand a rethinking on their categorisation.

An engagement with materials based in experimental design does not only produce the new, hybrid method of developing materials. "Materials with sensitive, smart or properties that vary in gradual ways [... lead to] new and multilayered design concepts. These open up new possibilities on the levels of conception, form, structure and surface."[11] Experimental design in the sense described here looks beyond purely technical parameters of materials to qualities such as aesthetics and function, sensory qualities, the evocation of emotions, but also towards immaterial qualities that tend to resist a theoretical description.

In this context sustainability and the development of sustainable and eco-friendly substances have increasingly assumed central roles in the process of materialisation. For instance, the search for alternatives to petrochemical substances has directed the experimental interest of designers towards processes of organic growth that can be accomplished with enzymes, fungi, proteins or bacteria. The interface between design and natural sciences has assumed an important role especially with sustainable materials. Here, designers are challenged to analyse and comprehend the scientific and technical implications of materials and then use and expand their potentials in creative and innovative ways. For instance, biological processes serve to breed fungi mycelia in the shape of threads as a substitute for styrofoam in specific shapes, or cellulose grown by

10 Kraft, Sabine: "Werkstoffe. Eigenschaften als Variablen", Arch+ 172, 2004, p. 24-28, here: p. 24.

11 11 Holzbach, Markus: "Fragen an Markus Holzbach, HfG Offenbach", in: "Von traditionellen Materialien zu zukunftsorientierten Materialentwicklungen", published by: Präsident der Hochschule für Gestaltung, Offenbach am Main, 2014, p. 12-17, here: p. 13.

bacteria becomes a textile material for the production of clothing. At the Central Saint Martins University of Arts in London, Suzanne Lee examines how microbes spin cellulose via fermentation and can create whole garments organically in her bio-design project "BioCouture". Bacteria in water tanks are being fed with sugar and produce a gel-like sheet of textile that can be lifted from the surface and dried after completing the growing process. The drying process turns the haptic qualities of the textile from gel-like to a dry, skin-like surface that is fully compostable at the end of its' life cycle. But bacterial cellulose that is grown by the bacterium acetobacter xylinum extracellularly is by no means a novelty, as the British biochemist Adrian John Brown has discovered the method as as early as 1886. Therefore, designers have not newly invented this material, but rather have newly discovered it for their own uses and developed new impulses of materialisation at the interface of natural sciences and design by applying biological growth processes in their work.

With her project "Growing Patterns. Living Pigments" the artist and designer Julia Moser has developed a method to dye textiles by using bacteria in a laboratory, thereby providing another example for innovative work in bio-design. Her method harnesses living organisms and provides a sustainable way of dying that saves on resources and does not use any harmful chemicals. The bacteria cultures multiply on the smallest of spaces and require neither large areas of land, nor the use of pesticides or massive amounts of water to accomplish their task. To achieve competitiveness with other methods of dyeing and printing on the aesthetic level, the project aims to navigate the bacteria in their development so that they will produce defined patterns on textiles. By combining dyeing by bacteria with traditional and new technologies, Moser is developing innovative possibilities in textile patterns.

As resources dwindle and products need to become compatible with the environment more and more, designers become ever stronger interested in working with renewable raw materials or refuse from agrarian production as well as organic by-products. Between the poles of low tech and high tech, presumed waste products are being turned into new materials with surprising profiles of properties and new applications by using insights from the natural sciences and an innovative attitude. These material experiments result in hybrid products such as stools made from seaweed (Carolin Pertsch), lampshades derived from coffee grinds (Raúl Laurí) or beakers created from human hair (Thomas Vailley).

A beautiful example for the new impulses of materialisation applied to a waste product by traditional methods and processes is the proj-

ect “Forest Wool” by Tamara Orjola. The designer used pine needles that occur as bio mass in the forestry industry to develop items such as carpets and stools. Traditional production methods such as shredding, steeping, steaming and pressing can process pine needles into textiles, composite materials and paper. Combining waste products with new technologies in the context of an engagement with materials is also of significant interest. The design studio Krill Design provides an example with their project “Rekrill Orange”. The Italian firm uses food waste such as orange peels from juicing plants to create eco-friendly products via 3-D printers. Raw materials such as seeds, peels and zests of Sicilian oranges are processed into a filament and then used in a 3-D printer via a patented method.

The list of new developments in materials at the interface of design, material- and natural sciences and technology is long. These projects demonstrate in impressive ways how visionary and surprising material impulse emerge by networking among design and other disciplines. These results then create new synergies. Engaging with materials as a space for exploration and hybrid experiments in the design process raises the profile of design conducted by research. Designers will push forward processes and impulses of materialisation on the one hand. But their practical engagement with materials will result in further approaches and methods focussed on materials and thereby sharpen and provide contours to this emerging area of research, as new theoretical approaches in this arena can only be formulated by engaging with materials on a physical level. The early methods and approaches for a design oriented towards materials are still making baby steps and have to be reflected on, analysed and expanded by applications on new projects based on specific substances. As Elvin Karana writes: “...this will bring new insights and help us to refine the method’s steps to a greater level of detail and application”.[12]

We therefore need theoretical, as well as practical research that is devoted to experimental research on materials in design in a contemporary manner to generate new knowledge in this rather new field of research and also make it applicable.

12 Karana, Elvin, Barati, Bahareh, Ragnoli, Valentina und Zeeuw van der Laan, Anouk: “Material Driven Design (MDD): A Method to Design for Material Experiences”, International Journal of Design Vol. 9 No. 2, 2015, S. 35-54, here: p. 49.

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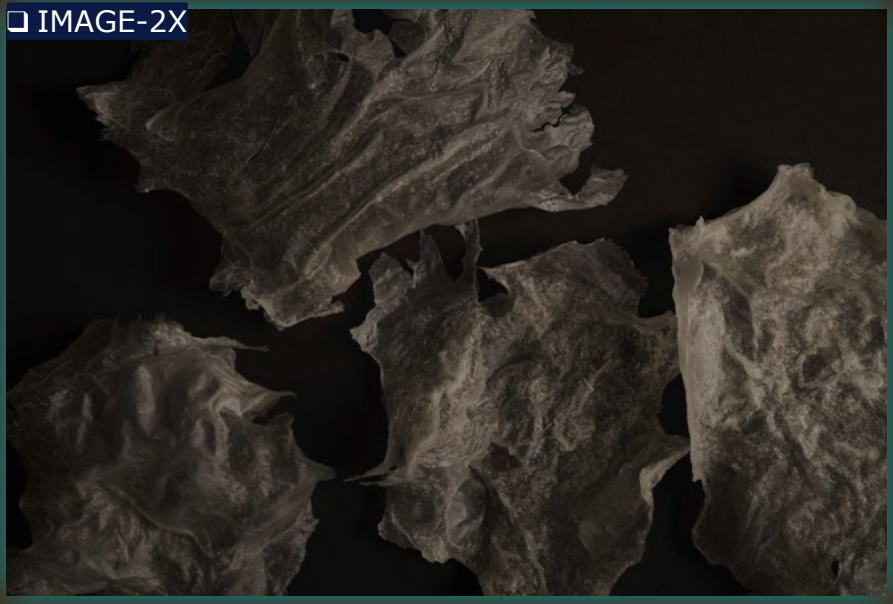

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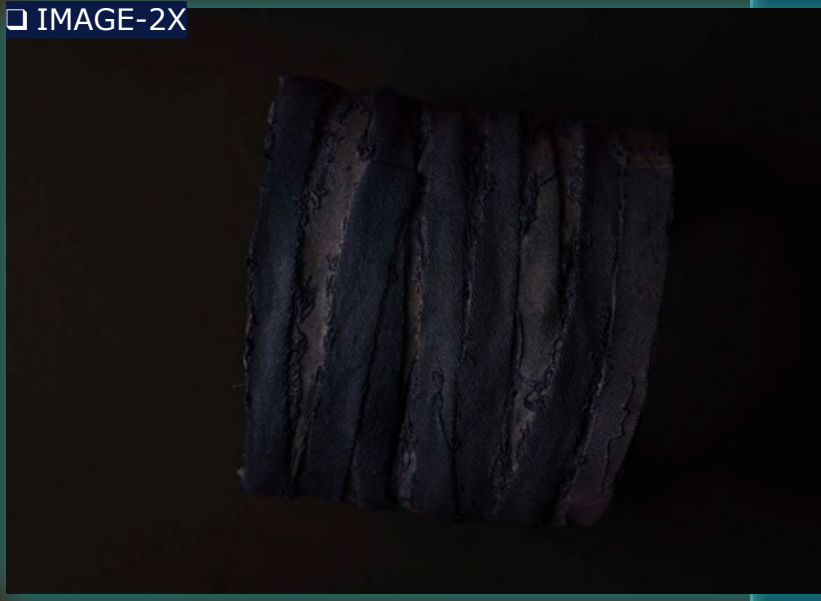

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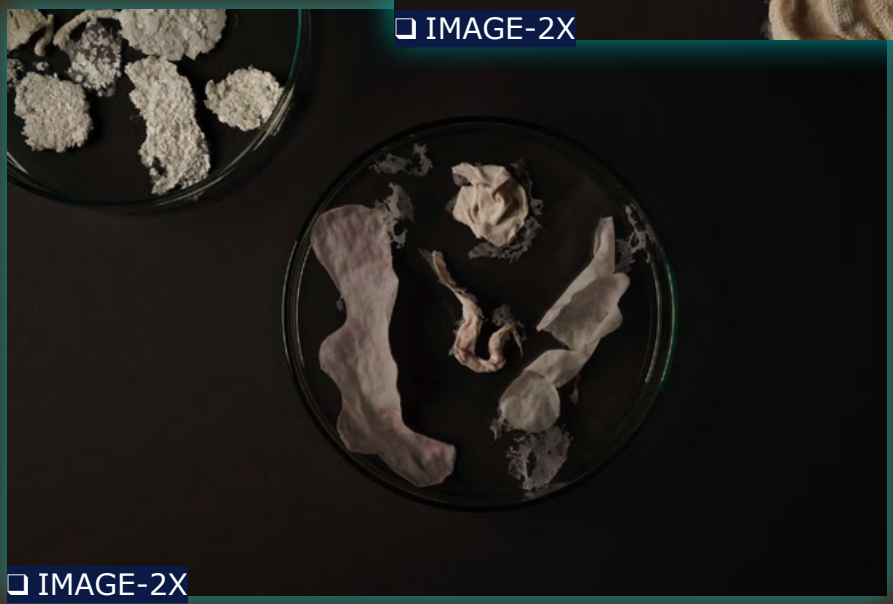

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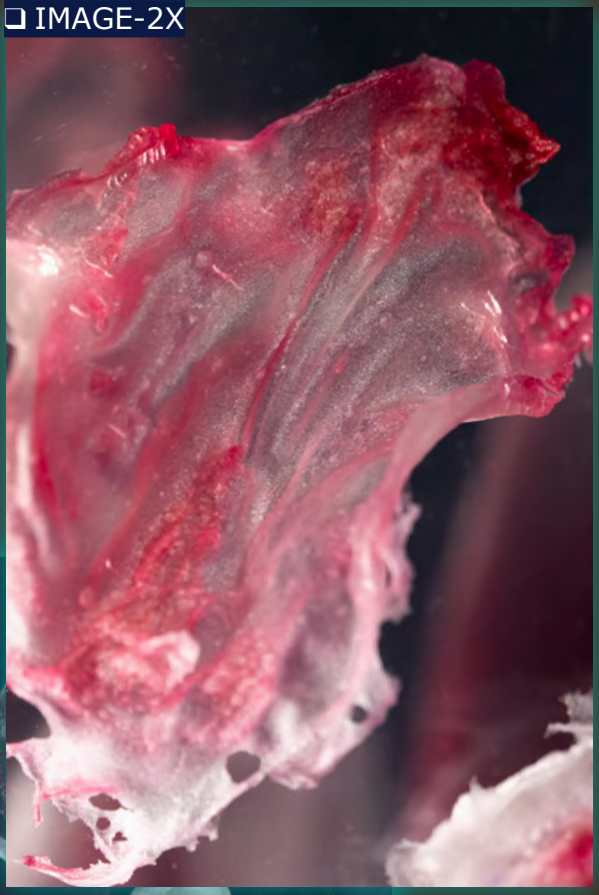

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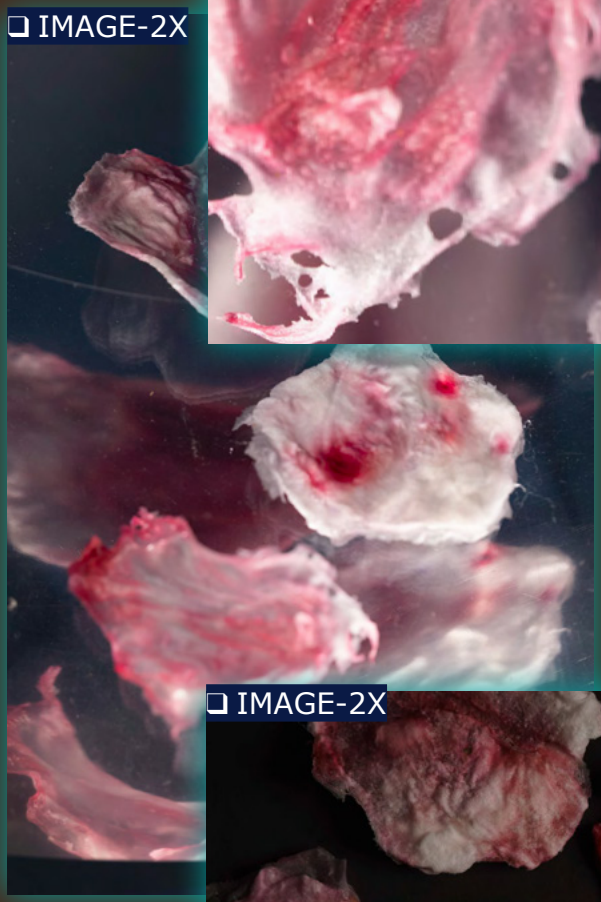

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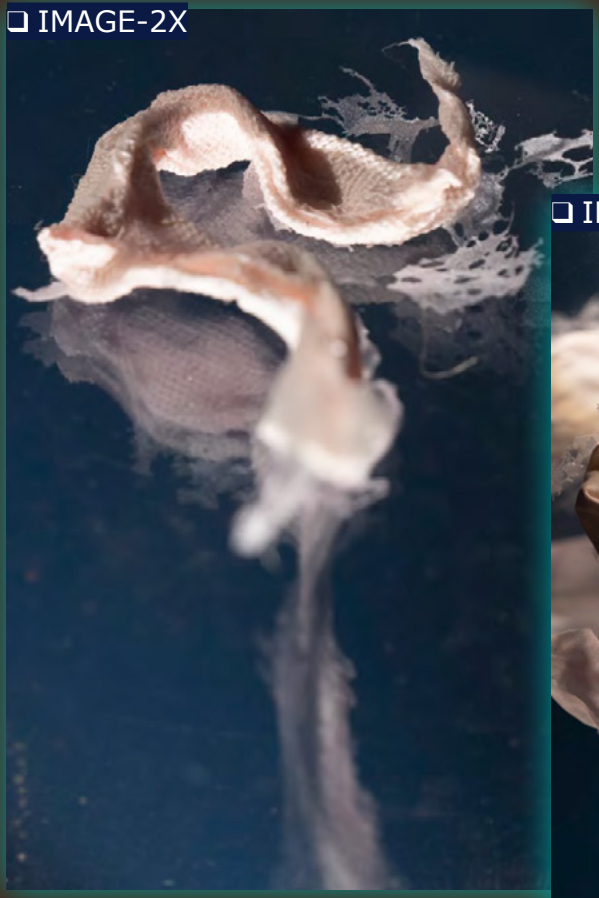

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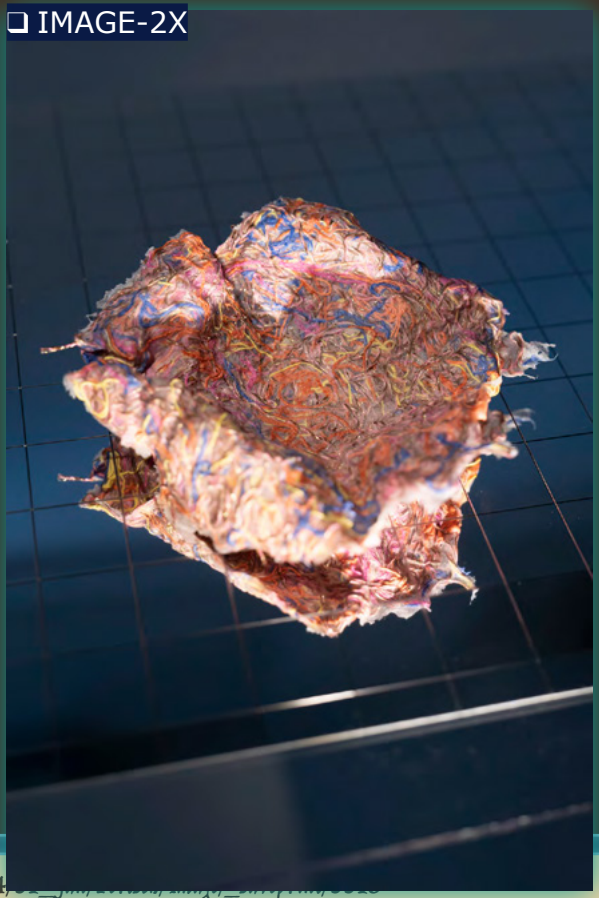

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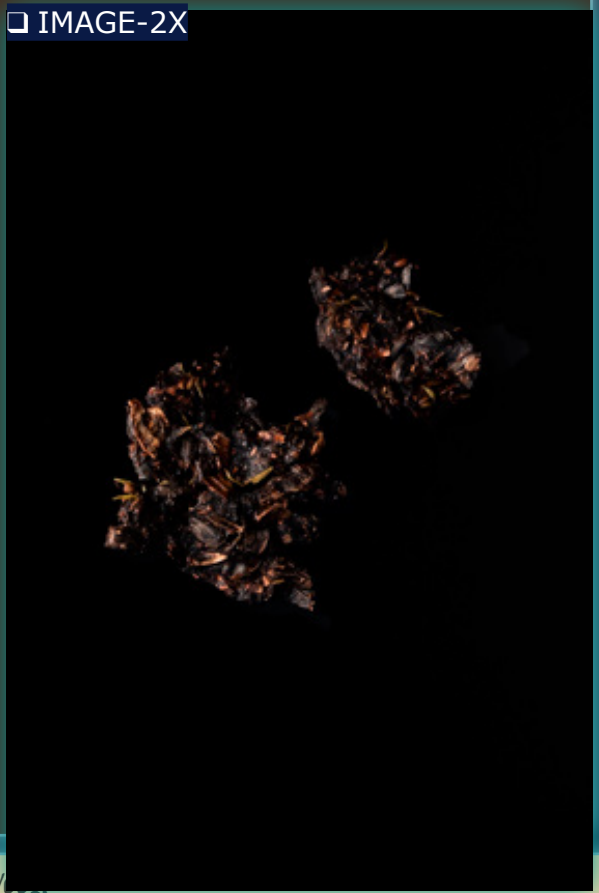

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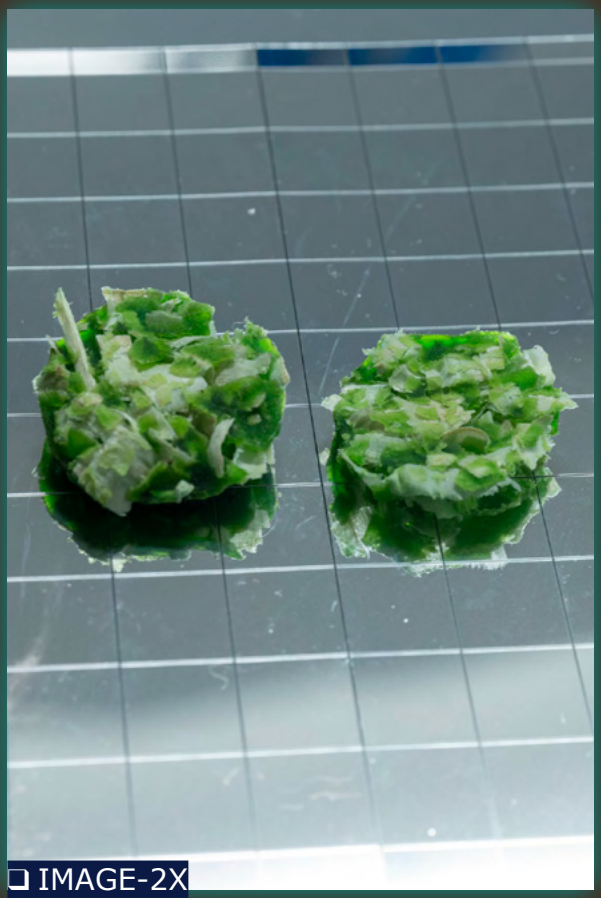

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