European Polymer Dispersion and Latex Association

STATEMENT

20 October 2023

EPDLA's position paper on polymer dispersions, redispersible powders made thereof and synthetic polymer microparticles

The EPDLA (European Polymer Dispersion and Latex Association, a Cefic Sector Group) is dedicated to promoting the safe manufacture, transportation, distribution, handling and use of waterborne polymer dispersions and redispersible powders made thereof in compliance with regulatory requirements and industry guidelines.

EPDLA members are committed to Responsible Care® principles and have implemented risk management according to the precautionary principles.

Polymer dispersions

Polymer dispersions are used as raw materials (binders) in many waterborne applications, for example in adhesives, varnishes and coatings, printing inks, non-wovens, paper and paperboard textile finishing agents and redispersible powders. Polymer dispersion technology has been used safely and successfully for more than 70 years and has contributed significantly to a reduction in the release of organic solvents into the environment. The use of polymer dispersions has helped to reduce the use of organic solvents in workplaces leading to improved worker health and similarly has contributed to cleaner air in the home. Common to all dispersions and covered by this statement, is a film forming process during application.

Polymer dispersions are mixtures as defined under Article 3(2) of the REACH Regulation[1], consisting mainly of water and high molecular weight polymer droplets. Based on polymer weight and chemical nature, the polymer droplets are typically highly viscous. The particle size of such polymer droplets can widely vary between ca. <100 nm (<0.1 µm) and 10,000 nm (10 µm) in diameter[2]. For more details on the status of polymer dispersions with respect to nanomaterials, please refer to the EPDLA position paper on nanomaterials[3].

Within a dispersion, the polymer droplets are dispersed and stabilised in water and regarded as embedded in the liquid matrix. They cannot be isolated as discrete droplets or particles by simple separation techniques and do not exist without their waterborne environment. Their fate is to form a film e.g. as an adhesive or paint.

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[1] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

[2] nm = nanometer / µm = micrometer

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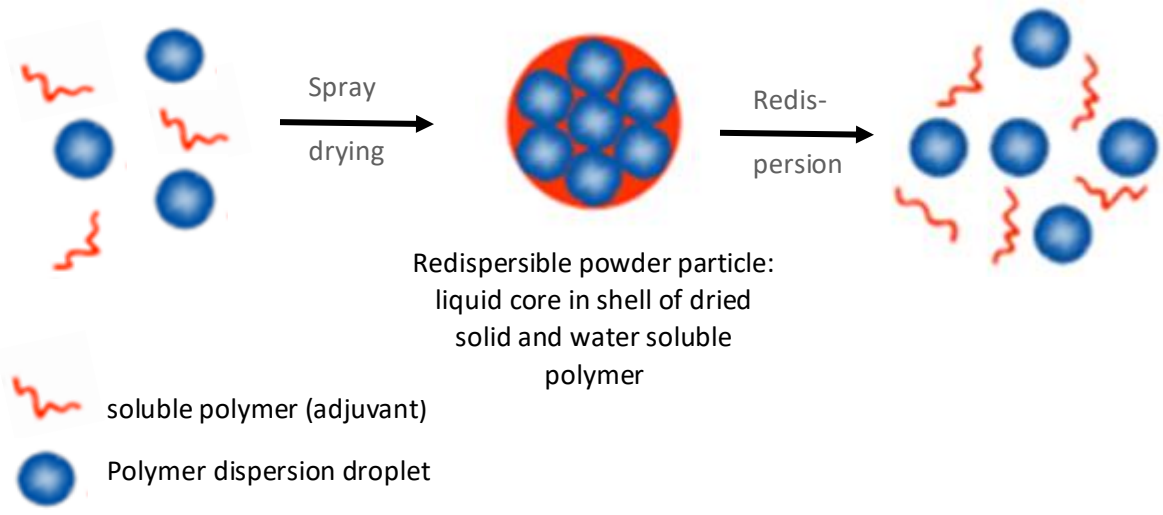
As the water in the mixture evaporates, a separation between the aqueous and the polymeric phase begins and leads to the film formation via coalescence of the polymer droplets[3,4].
Human or environmental exposure to individual polymer droplets is thus not expected under advised conditions of use.

Redispersible polymer powders

Redispersible polymer powders (RDP) are obtained through spray-drying of polymer dispersions with the help of a spray drying adjuvant polymer. Such spray drying adjuvant polymers are solid and water soluble polymers. During spray drying larger particles in the micrometer range, typically >1 µm are formed as loose agglomerates of a few polymer dispersion droplets individually covered by the spray drying adjuvant polymer.

The RDPs are usually free-flowing fine powders, with a particle-size distribution in the micrometer-range. Moreover, the RDPs contain a sort of liquid core (the original dispersion polymer droplets) in a shell of a dried solid and water soluble polymer.

In contact with water, the redispersible polymer powder particles disappear as the soluble polymer dissolves and release the individual dispersion droplets in their original state again. This redispersed polymer droplet has the same properties as the original polymer dispersion droplet.



[3] EPDLA position paper on polymer dispersions and nanomaterials (updated Dec. 2022)
[4] (469) EPDLA Sector Group of Cefic - YouTube

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Due to their decisive influence on cement, lime or gypsum based finished drymix mortar products, as well as on cement free and mineral-binder free systems, redispersible polymer powders are mainly used as building material additives in construction-applications to provide e.g. adhesion to many types of surfaces and substrates or waterproofing.

Polymer Dispersions and synthetic polymer microparticles

On September 25, 2023 the European Commission published regulation (EC) No 2023/2055[5] amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards synthetic polymer microparticles.

According to the regulation synthetic polymer microparticles are *polymers that are solid and which either:*

(a) are contained in particles and constitute at least 1 % by weight of those particles, or
(b) build a continuous surface coating on particles.

The polymer droplets of a typical polymer dispersion are dispersed and stabilized in water and regarded as embedded in the liquid matrix**.** These polymer droplets have to be seen as liquid (highly viscous), otherwise coalescence of the polymer droplets to a polymer film upon drying could not occur. Any crosslinked or very high molecular weight polymer molecules contained in the polymer dispersion droplet are diffusely (no interface) distributed within that droplet. This ensures that the polymer droplet can form a homogeneous film by coalescence[4] when the water is removed (Minimum Film Formation Temperature of the polymer below room temperature, see below). The outer shell of dispersion polymer droplets consists typically of polymer molecules in the lower molecular weight range which are anyway liquid and more hydrophilic. These lower molecular weight polymers interact strongly with the typically present emulsifier to stabilize the emulsion in water. This excludes typical polymer dispersions to fall under the synthetic polymer microparticles definition: The droplets are not considered solid particles nor do they form a continuous surface coating on particles.

The above clarifications apply both to individual substances and mixtures where dispersion polymer droplets may be present at a concentration ≥ 0.01% w/w, such as, for example, in adhesives or paints.

While most polymer dispersions, due to this lack of solidity of the polymer droplets, cannot be considered synthetic polymer microparticles, there may be polymer dispersions that could be considered synthetic polymer microparticles due to their high minimum film formation temperature.[6]

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[5] EUR-Lex - JOL_2023_238_R_0003 - EN - EUR-Lex (europa.eu)

[6] Even with high-MFFT polymers, coalescence can be forced by adding so called coalescence agents. This is typically done by downstream users, e.g. paint manufacturers.

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For these cases, however, derogations will apply, as described in the following: Applications of polymer dispersions involve the formation of a film. Film formation is critically dependent on the minimum film forming temperature (MFFT) of the polymer dispersion, which is the lowest temperature at which a thin layer of a polymer dispersion will still dry to form a coherent film.

Since continuous, uniform film formation, as prescribed by the MFFT, is not a must for deciding whether the polymer is liquid or solid, the so-called white point could also be used here: This is the temperature at which coalescence of the polymer droplets into a polymer film begins and at which an opaque film changes into a transparent film, which is a clear indication of the presence of liquid material.

Both MFFT and white point can be measured according to the ISO 2115 standard. The minimum film forming temperature (MFFT) is a widely used and extremely important application-relevant property of polymer dispersions (see above). The white point temperature describes much better the coalescence temperature of polymer dispersions droplets and should therefore be used for the microparticle classification in certain cases (i.e. near room temperature). In many cases, when the MFFT is clearly below room temperature, the use of the MFFT will suffice.

Paragraphs 4 and 5 of the draft synthetic polymer microparticle restriction provide derogations for the placing on the market of synthetic polymer microparticles or mixtures containing such microparticles if:

- they are used at industrial sites;
- or if the resulting film does not meet the definition of a synthetic polymer microparticle;
- or if the microparticles are permanently incorporated into a solid matrix at the time of use,
- or if the microparticle is contained by technical means so that no release to environment can occur.

We therefore understand that the use of polymer dispersions for most applications will not be impacted by the restriction for placing on the market under this regulatory proposal. However, the European Commission foresees labelling and reporting requirements which comprise among others: Suppliers of aforementioned derogated products containing synthetic polymer microparticles shall provide instructions for use and disposal to avoid releases of synthetic polymer microparticles to the environment as well as information on quantity or, as applicable, concentration of synthetic polymer microparticles in the substance or mixture.

Redispersible polymer powders and synthetic polymer microparticles

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soluble polymer. They exist as a mixture of two polymers, the spray drying adjuvant polymer and the dispersion polymer.
Since the spray drying adjuvant polymer has a solubility of much greater than 2g/l, it is excluded from the restriction. The second polymer coming from a dispersion is considered liquid if the MFFT of the original polymer dispersion is lower than room temperature (ca. 20°C) or in case temperature is above MFFT. Thus, in most cases redispersible polymer powders do not fall under the synthetic polymer microparticles definition. When dissolving, the redispersible polymer powder particles disappear as the soluble polymer dissolves and releases the individual dispersion droplets in their original state again (i.e., they have to be seen as liquid (highly viscous) in case MFFT of the original polymer dispersion is below room temperature). This redispersed dispersion polymer has the same properties as the polymer droplet from the dispersion of origin and hence does not fall under the synthetic polymer microparticles definition.

Are redispersible polymer powders concerned by 'Operation Clean Sweep' or the proposed Regulation of the European Parliament and of the Council on preventing plastic pellet losses to reduce microplastic pollution?

Operation Clean Sweep (OCS[7]) is a voluntary industry initiative to minimize plastic pellet loss. The term pellet covers either resin pellets, flake or polymer powders. However the powders covered by OCS are insoluble and meant for the manufacturing of plastic, whereas redispersible polymer powders go into totally different applications like for example in concrete or mortar formulations. Furthermore the outer shell of such RDPs is soluble and the "inner core" in most cases liquid, as discussed above.
This pellet definition of Operation Clean Sweep contrasts the Proposal for a Regulation of the European Parliament and of the Council on preventing plastic pellet losses to reduce microplastic pollution COM(2023) 645[8], where "plastic pellet" means "a small mass of preformed polymer-containing moulding material, having relatively uniform dimensions in a given lot, that is used as feedstock in plastic product manufacturing operations".
Latter definition clearly does not comprise redispersible polymer powders, as they are not intended for moulding.
Therefore, EPDLA sees RDPs not concerned neither by the OCS initiative nor by proposed regulation COM(2023) 645.

National regulations

EPDLA is aware of national regulations, for example in France, to regulate Microplastics. In the case of the French restriction on the use of Microplastics (art. 82, AGEC law), which entered into force January 1st, 2023, it is impossible at the current stage to comment on the regulatory proposal due to the lack

[7] https://plasticseurope.org/de/knowledge-hub/operation-clean-sweep-progress-report-2019/

[8] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12823-Microplastics-pollution-measures-to-reduce-its-impact-on-the-environment_en

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of definitions. French Chemical industry Associations actively advocate for a harmonization of the French regulation on Microplastic and the European regulation on synthetic polymer microparticles.

Conclusion

The EPDLA members conclude that any polymer dispersion with a white point or MFFT below room temperature (around 20°C) would be an emulsion, and hence does not contain synthetic polymer microparticles.

Redispersible polymer powders (RDP) consist typically of two different polymers: a solid but water soluble polymer which forms the "outer shell", and a few inner dispersion polymer droplets. The solubility of the soluble polymer part is usually much greater than 2g/l. The "inner core" typically consists of a dispersion polymer with MFFT < room temperature, which means, this polymer has to be considered as liquid. Therefore, both types of polymers in a RDP and thus the redispersible polymer powder as such do not meet the criteria for synthetic polymer microparticles.

Disclaimer

- The present position paper has been developed by EPDLA members in good faith, to the best of its knowledge and following the latest scientific evidence.
- The position paper is offered to all EPDLA members for further use. Each producer might add additional information in the communication towards customers, depending on the specific situation.
- EPDLA commits to update this document in view of any new relevant available information.

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About EPDLA

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