

## DIMETHYLFORMAMIDE (DMF)

**Other Names** N,N-Dimethylformamide; N,N-Dimethylmethanamide; N-Formyldimethylamine; DMF or DMFa

CAS Number	Substance
68-12-2	N,N-Dimethylformamide (DMF)

**May Be Found In**

- Solvent residue in synthetic leather
- Leather and textile articles particularly associated with PU coated material,
- Plastic, rubber, adhesives, and printing inks
- Industry use mixture such as degreasing products for paints, varnishes and metals and adhesive

**DMF is an organic solvent produced in large quantities throughout the world. It is used in the chemical industry as a solvent, a chemical intermediate, and an additive.**

### Uses in the Supply Chain

DMF is a colorless, fishy smelling liquid which is miscible with water and many other organic solvents. It is a solvent commonly used in the production of polyurethane coated materials such as synthetic leathers. It can also be used to process coatings, adhesives, plastics, acrylic fibers, PU resins, or as a cleaning solvent.

### Why DMF is Restricted

- DMF is classified as toxic to reproduction (Reproductive toxic Cat 1B per EU 1272 / 2008 EC).
- The liver is the target organ for the toxicity of DMF in humans. DMF has low acute toxicity and is slightly to moderately irritating to the eyes and skin. Acute exposure to DMF has been observed to damage the liver in animal studies and in humans and exposure to the skin can cause dermatitis. Chronic occupational exposure to DMF by inhalation has resulted in effects on the liver and digestive disturbances in workers.<sup>1</sup>
- DMFa is classified as Substance of Very High Concern (SVHC) under REACH.

### Sourcing Compliant Materials from Your Suppliers

- Synthetic leathers made without the use of DMF may be available.
- Water based polyurethane formulations are becoming more common and may be suitable for production needs.
  - If DMF-free synthetic leather is produced in the same facility as DMF-containing processes, cross-contamination is likely.
  - Cross-contamination may also happen when DMF-free synthetics are stored or shipped together with DMF-containing ones.
- Validate incoming materials through laboratory testing to ensure that DMF levels do not exceed the AFIRM limit.<sup>2</sup>
- Communicate the requirement for control of DMF to upstream suppliers.



## Sourcing Compliant Formulations from Your Chemical Suppliers

- Communicate with the responsible person for chemical management at upstream suppliers to ensure formulations meet brand requirements.
- Check regularly the formulation and SDS from your chemical supplier to ensure DMF is not being added. It is suggested to use alternative solvents to prevent residual DMF in final products.
- For unknown chemical formulations, conduct testing to check for the presence of DMF.

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## Safer Alternatives

DMF is a commonly used solvent in PU coatings and synthetic leathers. Some alternative production practices exist for creating these materials without the use of DMF, but care should be taken to assess the alternative materials carefully, since in some cases other solvents may be used which are only marginally better than DMF.

Appropriate engineering controls such as closed loop recycling and air handling systems, as well as proper PPE, must be utilized whenever DMF is used in production.

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## Additional Information

Visit ECHA's Candidate List of substances of very high concern to view dossiers for many restricted substances <https://echa.europa.eu/candidate-list-table>.

- <https://sustainablechemicalprocesses.springeropen.com/articles/10.1186/s40508-016-0051-z>
- <http://pubs.acs.org/doi/abs/10.1021/op4002565>
- [https://echa.europa.eu/documents/10162/13640/5th\\_recom\\_draft\\_backgdoc\\_dmf\\_en.pdf](https://echa.europa.eu/documents/10162/13640/5th_recom_draft_backgdoc_dmf_en.pdf)
- <http://www.gaylordchemical.com/innovation-center-2/replace-a-problem-solvent/replace-dmf-with-dmso/>

## References

<sup>1</sup> Hohenstein Institute & Textile Exchange, Chemical Snapshots - N-N-Dimethylformamide. 17.03.2017, Revision 0.2

<sup>2</sup> Apparel and Footwear International RSL Management Group (Ed.). (2018, January 31). Restricted Substances List (RSL). Retrieved <http://afirm-group.com/afirm-rsl/>

Also consider:

Manufacturing Restricted Substances List (Publication). (2015, December). Retrieved <http://www.roadmapzero.com/programme/manufacturing-restricted-substances-list-mrsl-conformity-guidance/>