



Empowering Material Innovation: A Digital Tool for Small and Medium Businesses

CETMA

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The DiMAT project's Materials Designer (MD) toolkit directly addresses the challenges faced by small and medium-sized enterprises (SMEs) in the materials design process by providing a Software-as-a-Service (SaaS) solution. This approach eliminates the need for expensive software licenses and high-performance computing infrastructure. Instead, users access the toolkit's functionalities through a web-based interface, significantly reducing barriers to entry and enabling these companies to innovate and compete effectively. The Materials Designer toolkit helps to design materials with new properties, by modifying, combining single constituents, particles, and additives.

SMEs often lack the resources to invest in advanced material design tools, which are essential for developing high-performance and sustainable products. Traditional material design workflows usually involve time-consuming and costly physical testing and trial-and-error approaches.

The DiMAT Materials Designer toolkit, however, offers a different approach, providing access to advanced simulation capabilities within a user-friendly interface. This is especially helpful for SMEs that need to design new materials by combining different components or modifying their structure, for instance by changing the section of the synthetic textile filament, or adding layers, nanoparticles or additives. By storing all the data on the server, the toolkit can be used stand-alone without relying on other storage solutions. The toolkit leverages a multi-scale numerical approach combining it with a virtual testing approach, to simulate how new materials will behave in real-life.

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The key features of the DiMAT Materials Designer, supporting the design of new materials with specific properties include:

- **Material definition:** The toolkit provides a web-based interface to define and modify new materials, starting from the base component materials to the internal microstructure and eventually its layout arrangement. This is a considerable benefit for SMEs dealing with complex materials.
- **Properties calculation:** The toolkit is connected to a calculation server which executes virtual testing of the defined material and calculates its elastic properties. This feature enables SMEs to explore different material configurations without the need for expensive physical prototypes and calculation infrastructures.
- **Data visualization:** Users can select one or more materials and visually compare their properties and download text files with all available information. This capability enhances the user's ability to understand and utilize the toolkit's results effectively.
- **Data storage and access management:** All data related to material definition and calculated properties are stored on the server running the toolkit and shared among working groups to allow different users to access the same data. This promotes collaboration and ensures data is accessible when needed.
- **Multi-scale numerical approach:** This method allows analysing the properties of individual entities at relevant length scales, for example individual plies, and then determines the mechanical behaviour of the larger entity, such as a laminate. The presence of voids can be included, to estimate their influence on material performances.
- **SaaS paradigm:** The toolkit's SaaS paradigm makes it an ideal solution for SMEs, because they don't need to buy costly licenses or invest in dedicated IT infrastructure or IT skills.

The DiMAT Materials Designer toolkit, with its SaaS model, empowers SMEs by providing access to previously inaccessible material design capabilities. By removing the barriers of high costs and technical complexity, the toolkit fosters innovation, reduces development times, and facilitates the creation of more sustainable and competitive products. The features offered by the MD toolkit enhance the quality of the design, reduce design errors, improve the materials' mechanical properties and reduce the time needed to bring new products to market.

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