

1 *Lightweight construction sandwich element*

HIGHLY DAMPING LIGHTWEIGHT MATERIALS

Lightweight construction and high damping - these demands, apparently opposed at first glance, have now been united in an innovative high-tech material. Using it as core in sandwiches and profiles, it is possible to tailor its properties such as stiffness and strength, damping, high temperature and corrosion resistance. Consequently, e.g. working temperatures up to 1,100°C and corrosive environments are possible.

The principle of high damping is based on free moving particles in small cavities which store the vibrating energy for a short time and turn it into thermal energy.

The multifunctional materials are lighter than magnesium and damp 100 times more. Currently, these damping rates are only achieved by polymer materials at room temperature.

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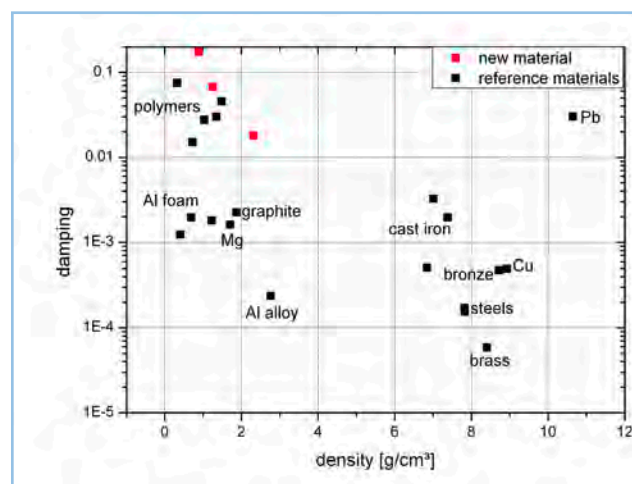
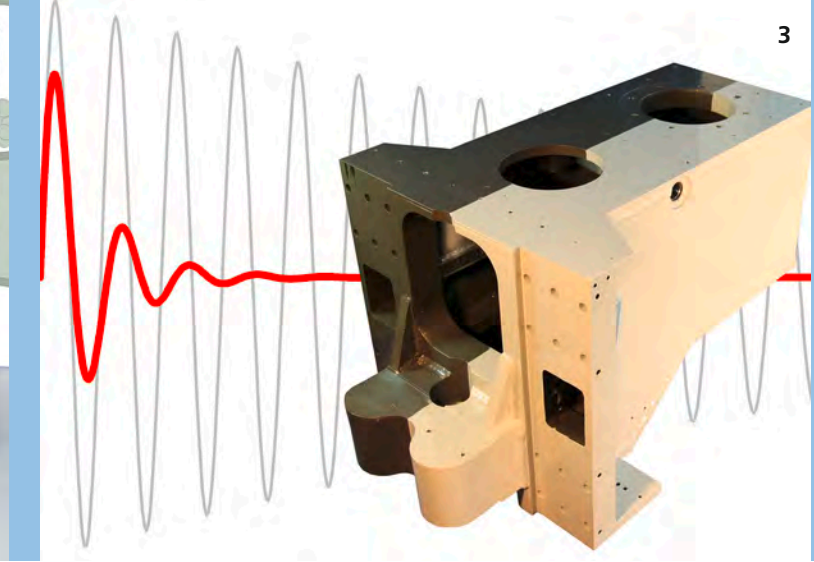


Fig. 1
Novel highly damping lightweight materials in comparison to conventional materials



Lightweight Construction for Mechanical Engineering

The application of these materials in mechanical engineering enables the massive reduction of moved masses. In constructions built for highest precision and highest positioning speed in particular, a significant decrease of cycle time is expected.

An estimation of the respective data of a fast-driven component expects a mass decrease of about 30 % and a damping increase ten times higher compared to a cast iron construction. Additionally, the total stiffness of the component can be doubled.

The focus lies on the following goals:

- **Damping of structural vibrations and structure-borne noise for noise reduction**

Vibrating surfaces radiate sound. Thus, a decrease of structural vibrations is a very effective way to reduce noise.

- **Higher precision**

Structural vibrations are not only caused by the drive unit but also by fast accelerated movements of different components. Effective methods to increase the precision are damping of the respective components, reduction of their mass, and damping of the contact area to the drive unit.

- **Higher machining rate**

Higher damping of the structural vibrations caused by accelerated movements allows higher accelerations with the same precision.

- Steel: High strength and excellent processability
- Ni-based and FeCrAl-alloys for mechanical stress at high temperatures
- Titanium: low density, high strength, high corrosion resistance
- Refractory metals: lightweight construction and insulation for highest temperatures

R&D Services

- Development of tailored highly damping materials and lightweight materials for high energy absorption
- Material development in regard to strength, damping, high working temperatures, corrosion resistance
- Material evaluation with respect to strength and deformation behavior
- Material and component testing
- Damping analysis
- High temperature material testing
- Corrosion testing
- Custom-designed studies on materials and processing
- Manufacturing of prototypes and small series
- Technical and scientific steering of up-scaling to industrial production

Materials

The materials can be used as core in sandwich and profile constructions or cast in aluminum or iron. There are many material options for the damping material itself:

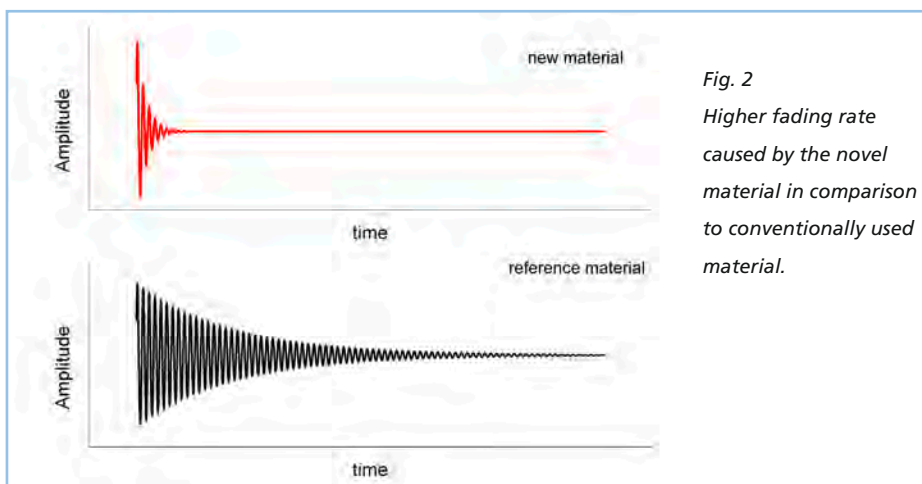


Fig. 2
Higher fading rate caused by the novel material in comparison to conventionally used material.

- 2 Examples for highly damping lightweight materials
- 3 Vibration-cushioned milling-slide