Handbook on Industrial Applications of Nanofluids in Energy Sector

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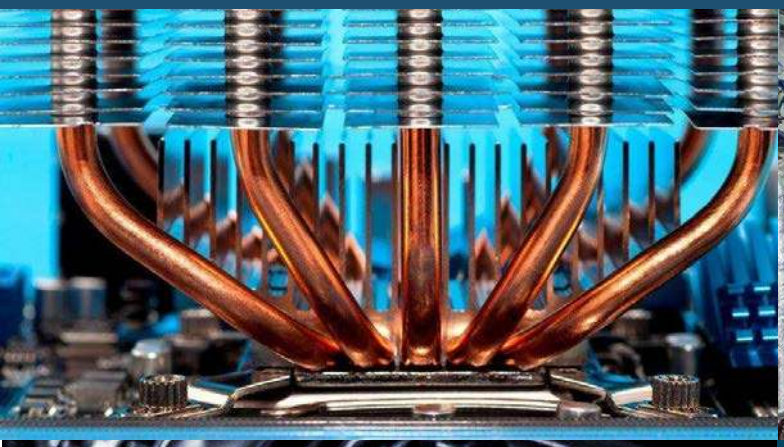


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Funded by the Horizon 2020 Framework Programme of the European Union

Melanin Particles for Solar Thermal Energy Conversion

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Heat transfer device

Rising energy costs, pronounced urban heat-island effect and global warming increase the need for intelligent solar heat management solutions. New Biomaterial (micro to nanoparticles, having a narrow particle size distribution), melanin, extracted from ink sac of a Cephalopoda animal, provides solutions for efficient management of solar devices, both for heat transfer fluids, with enhanced thermal properties, as well as pigment for solar selective absorbing lacquer or paint. The working principle without nanofluids of these types of paints is on the market, namely in domestic and small industry applications.

Effects following from employing nanofluids

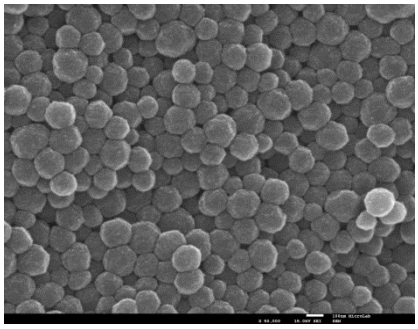
Efficiency of direct solar collectors can be increased as much as 12%, without selective absorbing paint. Melanin is also a very efficient heat storage material (high heat capacity between 60 and 120 °C) and it is a by-product or even waste-product from Cephalopoda animals for the food industry.

Nanofluid (1 wt% of melanin in water) has higher heat capacity and thermal conductivity than corresponding nanofluids with copper or graphite nanoparticles. Material is renewable and cheaper. No reactivity known.

Design rules correlations

Heat transfer coefficient and solar collector's efficiency can be enhanced, due to increase of heat capacity and thermal conductivity of nanofluid, without significant increase of viscosity and density.

Photos and plots



(SEM) image of melanin obtained from *Sepia officinalis* after isolation according to the method of the present invention, magnified 50 000 X.
Average size 138 nm, narrow PSD.

	Water	Melanin	Copper	Graphite
Heat capacity at 100 ºC (J/gK)	4.21	25	0.4	0.7
Heat capacity of 1 wt % in water nanofluid		4.39	4.14	4.15

REFERENCES

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