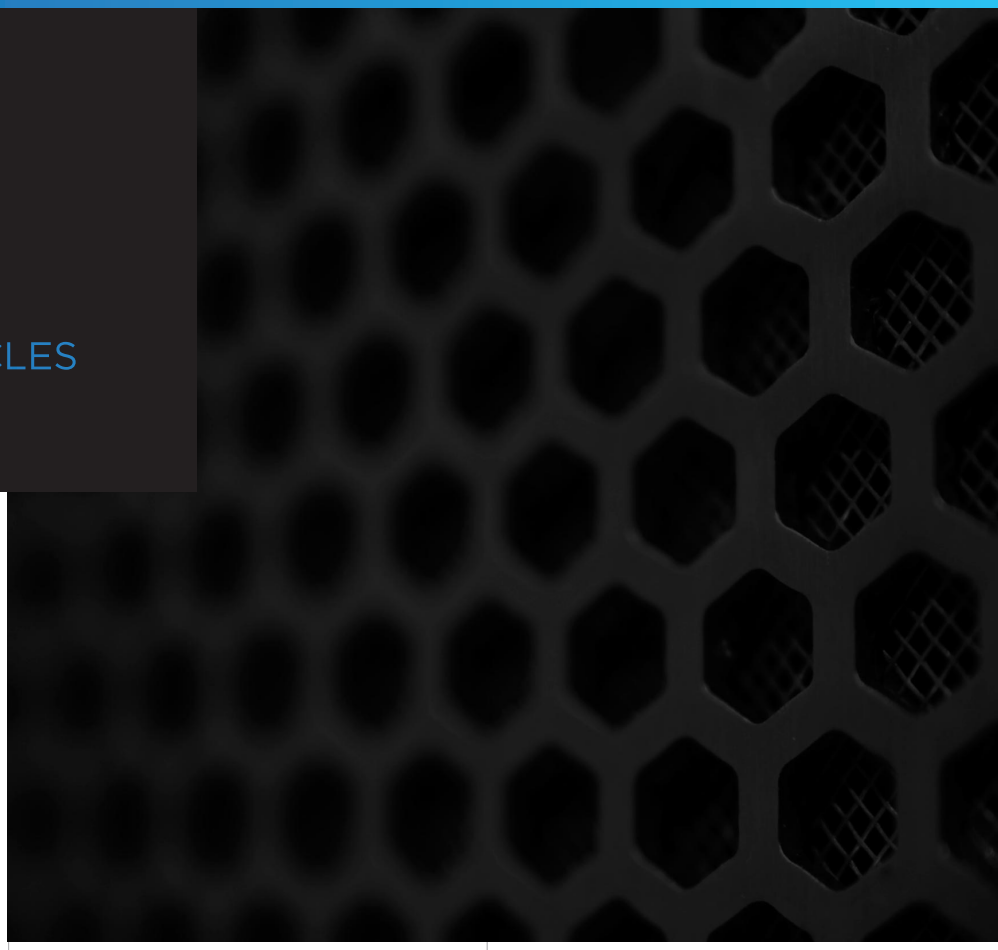
3-30 nm dN330

MAGNETIC NANOPARTICLES



DESCRIPTION

Product name: dN330

Material composition: Highly crystalline iron oxide magnetic nanoparticles of magnetite crystalline phase (Fe_3O_4), with particle size ranging from 3 to 30 nm.

Available Solvents: Nanoparticles can be dispersed in water and organic solvents:

1. **Aqueous dispersions.** Nanoparticles electrostatically stabilized with tetramethylammoniun hydroxide (TMAOH; pH = 13) or dimercaptosuccinic acid (DMSA; pH = 7).

2. **Organic solvent dispersions.** Nanoparticles sterically stabilized with oleylamine in low boiling point solvents (hexane, toluene, chloroform) or in high boiling point solvents (long-chain aliphatic hydrocarbons, long-chain amines, long-chain eters).

Synthesis: Proprietary synthetic method developed and registered by das-Nano. This method ensures the reproducibility of the synthesized nanoparticles in terms of particle size and particle size distribution.

Storage: 4-25ºC (do not freeze)

Main physicochemical properties:

- ✔ Crystalline phase (determined by electron diffraction and magnetometry): magnetite (Fe_3O_4)
- ✔ Particle shape (determined by transmission electron microscopy (TEM)): spherical/spheroid and geometrical shapes
- ✔ Particle size (determined by TEM (over 2.000 counts)): 3-30 nm
- ✔ Surfactant / solvent composition:
  - Aqueous dispersions: tetramethylammoniun hydroxide (TMAOH) / water or dimercaptosuccinic acid (DMSA) / water
  - Organic solvent: oleylamine / low boiling point solvents (hexane, toluene, chloroform) or high boiling point solvents (long-chain aliphatic hydrocarbons, long-chain amines, long-chain ethers)
- ✔ Concentration: 10 mg Fe_3O_4/ ml
- ✔ Saturation magnetization: 51 emu/g Fe_3O_4

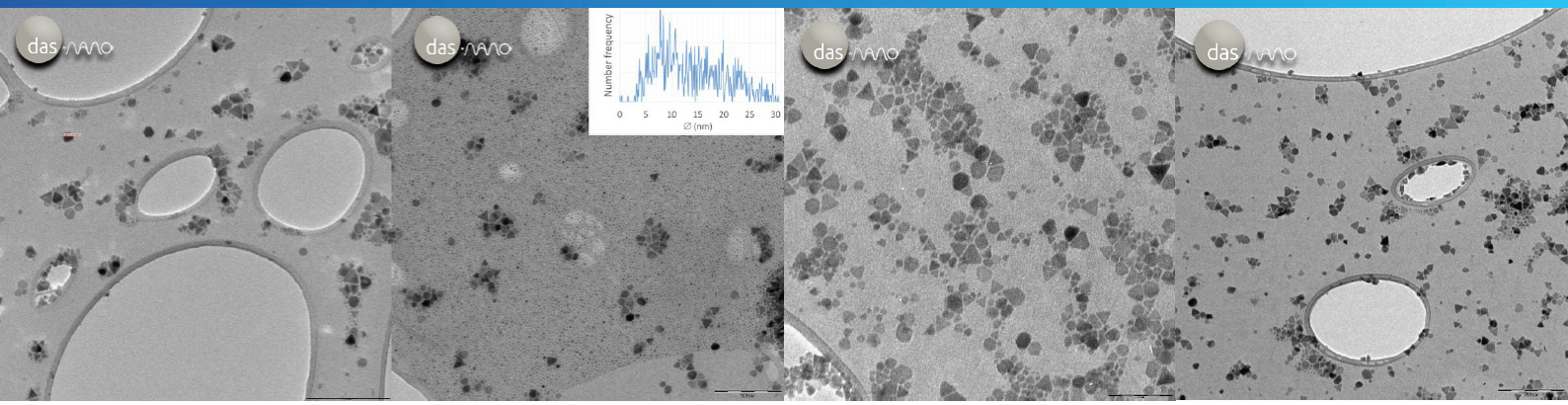


FIGURE 1. TEM IMAGES OF MAGNETITE NANOPARTICLES. SCALE BARS: 200 NM (UPPER IMAGES) AND 100 NM (LOWER IMAGES). INSET: PARTICLE DIAMETER DISTRIBUTION DETERMINED BY TEM

CHARACTERIZATION

TRANSMISSION ELECTRON MICROSCOPY (TEM)

Magnetite nanoparticles have spherical, spheroid and geometrical shapes (Figure 1).

Particle size range: 3-30 nm

ELECTRON DIFFRACTION (ED)

Magnetite nanoparticles are highly crystalline (Figure 2). The experimental d spacing between adjacent (hkl) lattice planes match 100% the d-values reported for Fe_3O_4 crystalline phase by Okudera, H., Kihara, K. and Mats (1996) in ICSD database (Inorganic Crystal Structure database).

MAGNETIC MEASUREMENTS

The material is ferromagnetic at room temperature. Saturation magnetization: 51 emu/g Fe_3O_4.

Magnetite crystalline phase is confirmed by the presence of the Verwey transition in the ZFC curve at 120 K (increase in magnetization), which is an intrinsic transition in magnetite that does not occur in maghemite.

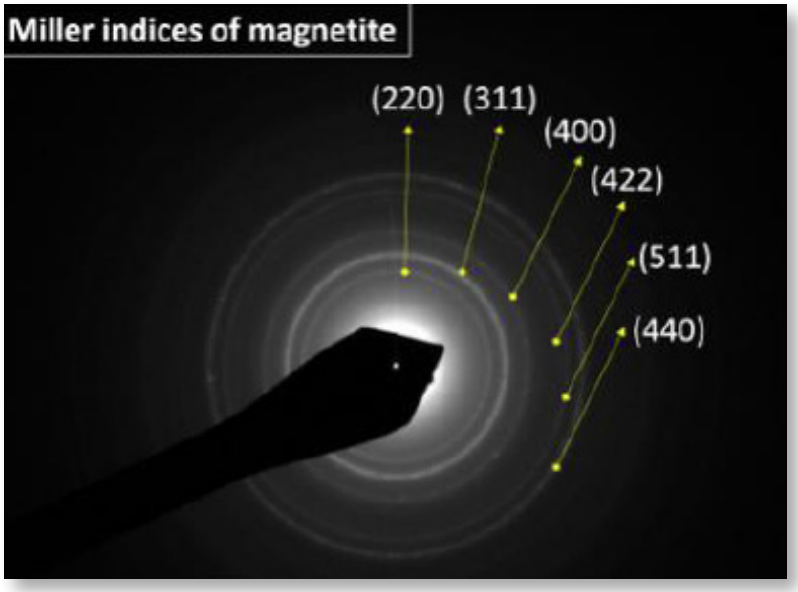


FIGURE 2. ELECTRON DIFFRACTION IMAGE OF MAGNETITE NANOPARTICLES. MILLER INDEXES OF EVERY DIFFRACTION RING ARE NOTED DOWN

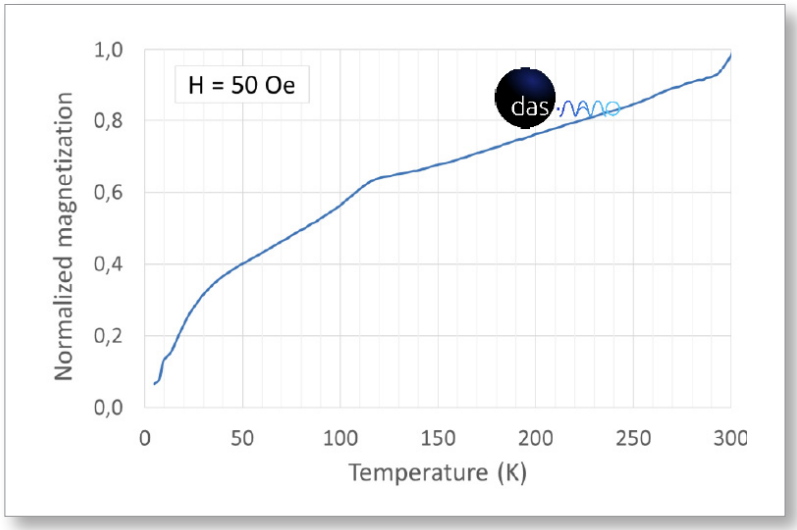


FIGURE 3. ZFC CURVE OF ONE REPRESENTATIVE SAMPLE