

## Heating nano particles for cancer research

**Objective** Heat magnetite ( $\text{Fe}_3\text{O}_4$ ) diluted in an acid, base and water to 120 °F (48.8 °C) for cancer research

**Material** Sample vials containing  $\text{Fe}_3\text{O}_4$  in various solutions

**Temperature** 120 °F (48.8 °C)

**Frequency** 282 kHz

**Equipment**

- Ambrell 2 kW induction heating system, equipped with a remote workhead containing two 0.33 $\mu\text{F}$  capacitors for a total of 0.66 $\mu\text{F}$
- An induction heating coil designed and developed specifically for this application.

**Process** A four turn helical is used to heat the samples. The sample vials are placed in the coil for 60-600 seconds to reach the required 120 °F (48.8 °C). Chart below indicates testing times and temperatures.

Sample	Time					
	60 Secs	120 Secs	150 Secs	180 Secs	300 Secs	600 Secs
5	77 °F	N/A	N/A	N/A	87.8 °F	91.4 °F
6	98.6 °F	116.6 °F	N/A	N/A	N/A	N/A
7	84.2 °F	N/A	N/A	96.8 °F	104 °F	109.4 °F
8	96.8 °F	N/A	107.6 °F	N/A	123.8 °F	N/A

### Make up of samples

Sample #	Nanoparticle	Surfactant	Solvent
5	$\text{Fe}_3\text{O}_4$	Amine	$\text{H}_2\text{O}$
6	$\text{Fe}_3\text{O}_4$	None	$\text{NH}_4\text{OH}$ in $\text{H}_2\text{O}$
7	$\text{Fe}_3\text{O}_4$	di-n-propyl amine	$\text{H}_2\text{O}$
8	$\text{Fe}_3\text{O}_4$	none	$\text{HNO}_3$ in $\text{H}_2\text{O}$

**Results/Benefits** Induction heating provides:

- Direct and precise placement of heat
- Controllable temperature
- Faster heating times



Vial of magnetite  $\text{Fe}_3\text{O}_4$  in coil