

Synthesis of metal alloys and semiconductor
nanopowders by the "electropulse" technique

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The "electropulse" technique, patented in 1994,
combines high current density short pulses with out-of-
phase high intensity short ultrasound pulses. This versatile
technique allows the production of dispersed
nanopowders with a mean diameter ranging between 10
nm to 1000 nm depending on the selected electrochemical
and ultrasound parameters.

Recently, a semi-pilot unit has been developed at
the Université Libre de Bruxelles for the production of
more than 100 g nanopowder / day. This unit is presented.

Examples of magnetic nanopowders like binary
and ternary alloys of Fe, Ni and Co and binary alloys in
the Pd, Fe and Pt, Fe systems are described. Their
compositions and structures are studied by HRSTEM,
HEED and XRF. Their magnetic properties are measured
by Mössbauer spectroscopy and magnetometry.
Superparamagnetic particles, magnetic single domain
powders and multiple magnetic domain grains are
produced with compositions that may not correspond to
the thermodynamic phase diagram compositions.

CdTe nanoparticles for the production of non-
linear optical devices have also been synthesized by this
technique with a mean diameter ranging between 4 and 20
nm. Their optical properties are described.

Examples of incorporation of these
nanoparticles in a ceramic or a polymer matrix are
presented.