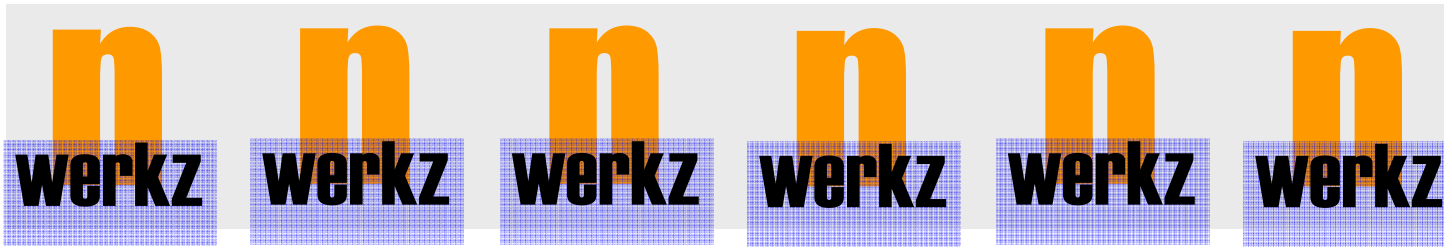


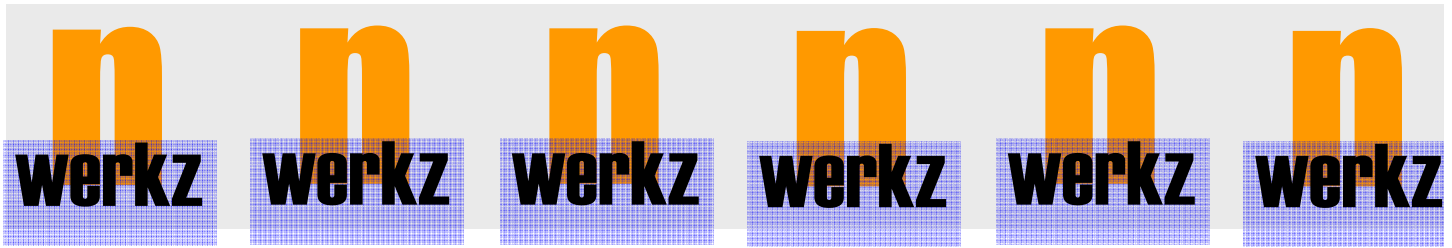
Planetary Grinding Mill & Applications for Milled Powder

George E. Kim

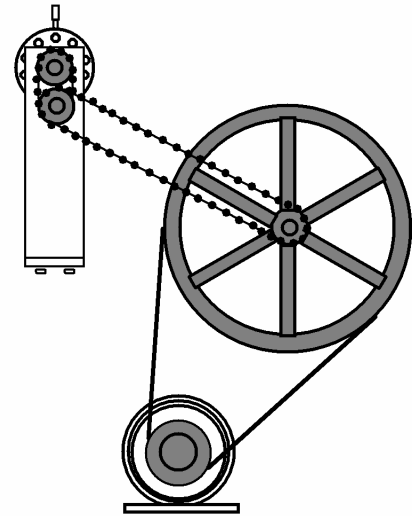
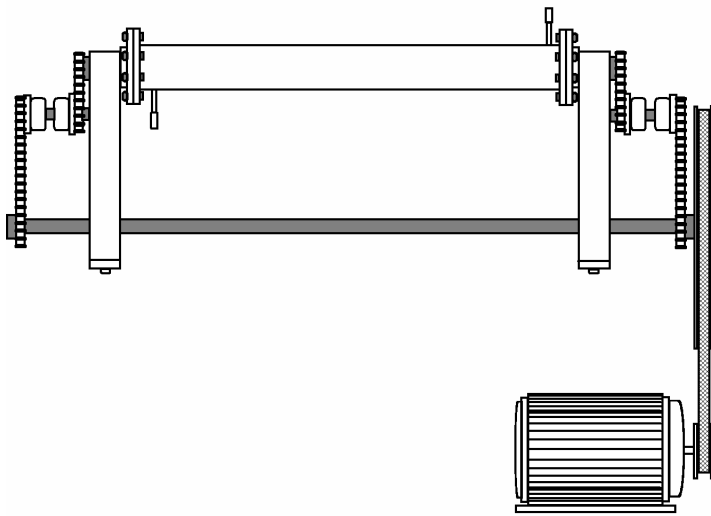
*Supported by United States Office of Naval
Research (Contract no. N00014-03-10146)
Dr. Lawrence T. Kabacoff – Program Officer*



“Objective is to develop an economical and scaleable means of producing nanostructured and/or nanosized powder using an advanced Planetary Grinding Mill technology”

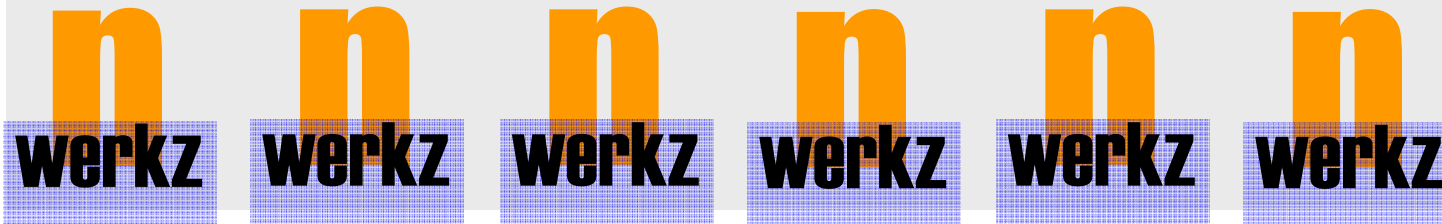


Schematic of PGM System

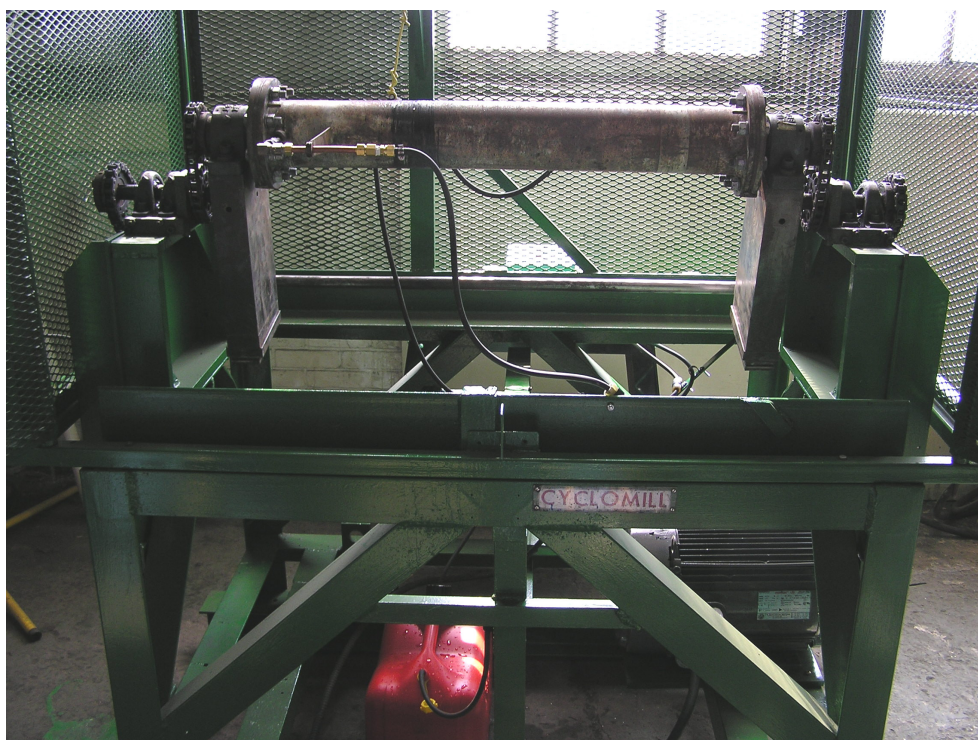


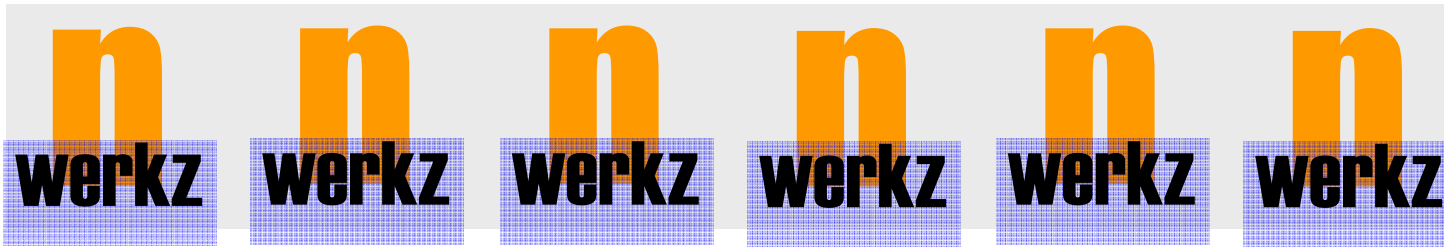
Characteristics:

- continuous feed;
- high energy;
- low wall contamination due to little movement of media w.r.t. chamber wall;
- very rapid size reduction and dispersion;
- good efficiency; and
- grinds **metals** (Inconels), **ceramics** (oxides, carbides), **intermetallics** (MoSi_2), and **polymers** (acrylics, vinyl, polyesters) to submicron or nano particle size range.



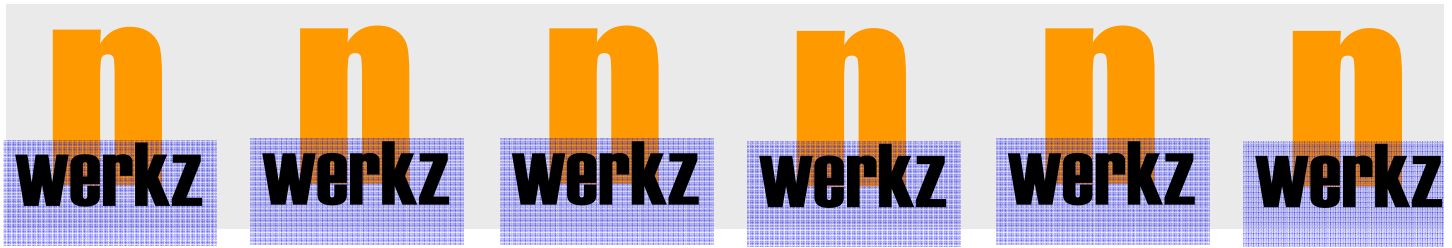
Photograph of
PGM System



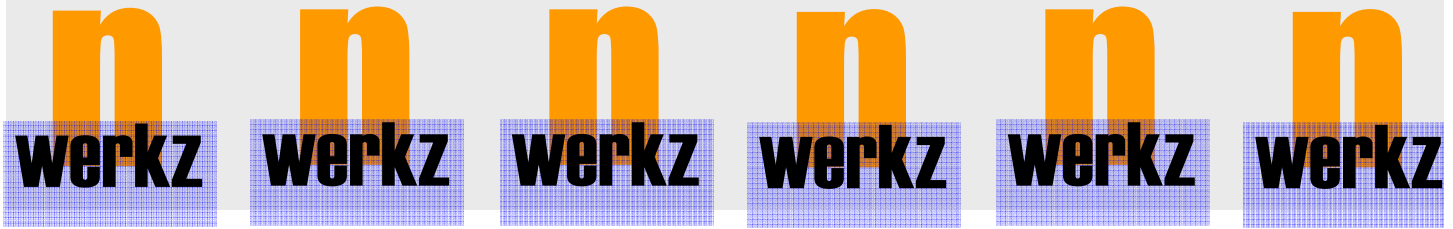


POTENTIAL APPLICATIONS FOR PGM MILLED POWDERS

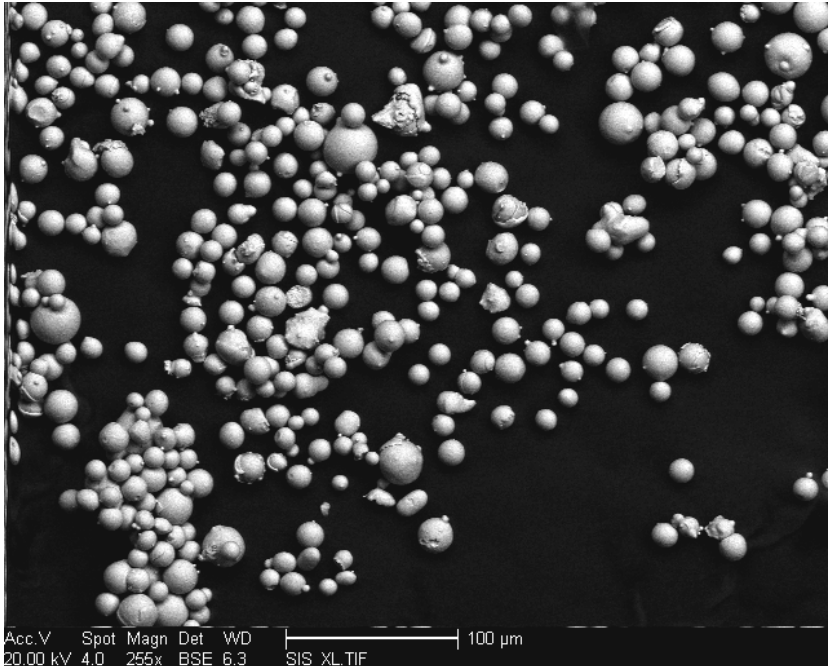
- **stronger and/or lighter Al alloy components via multi-scale structure**
- **superior TBC performance via nanostructured MCrAlY**



PRELIMINARY RESULTS USING OUR PGM SYSTEM



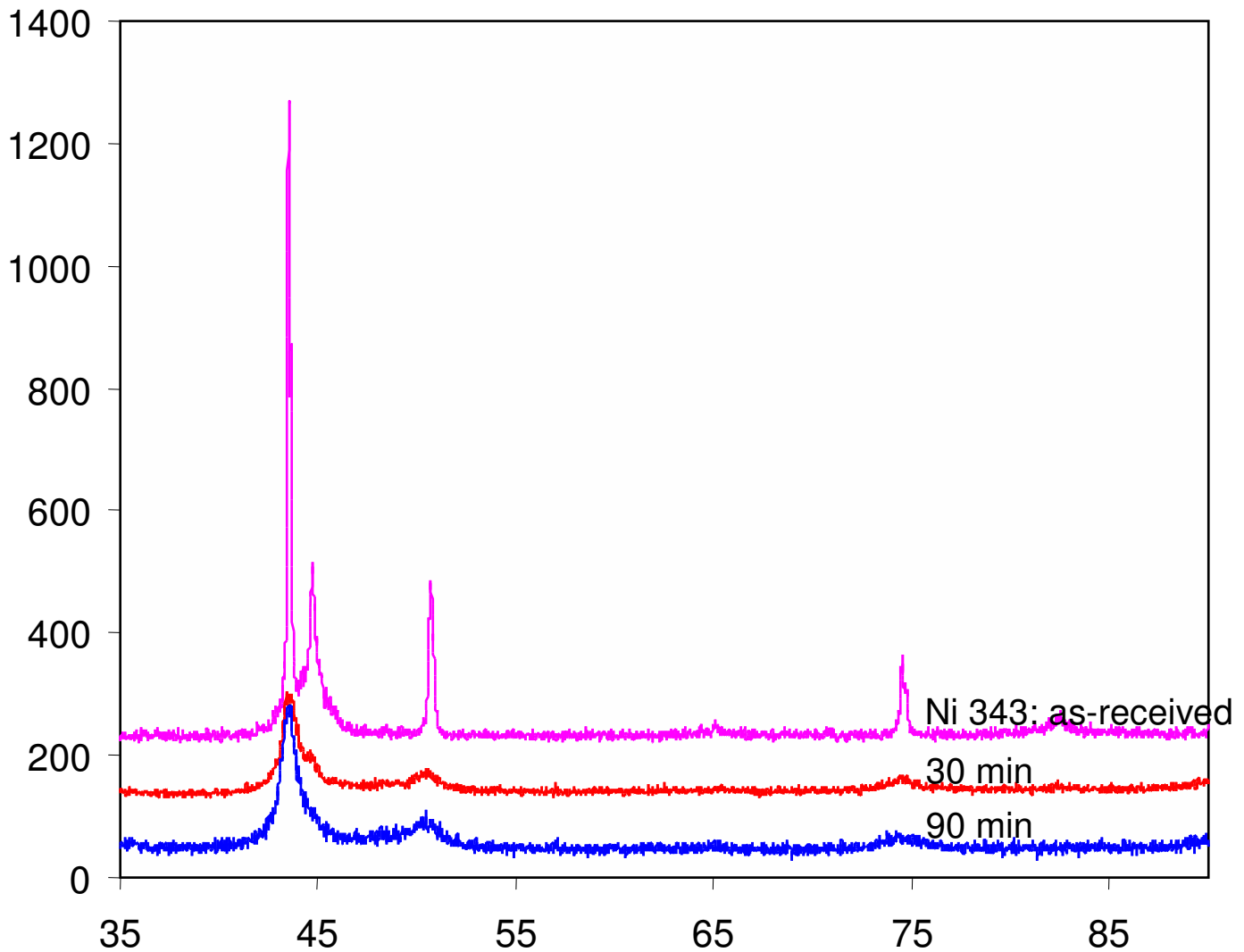
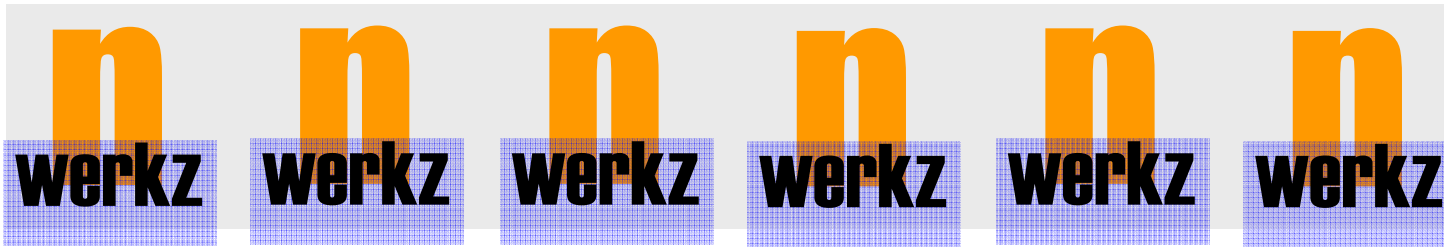
NiCrAlY Powder



original powder
(spherical atomized powder)

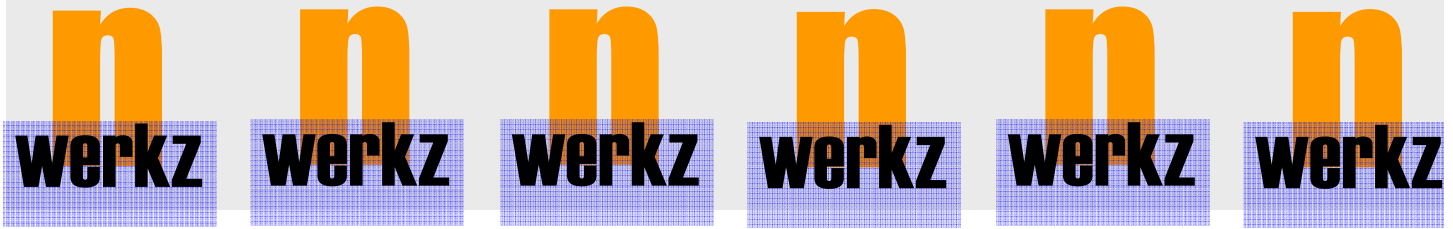
proprietary milling
without LN2 (started to
form equiaxed particles that
can be produced at much lower
cost and faster rate than via
cryomilling)



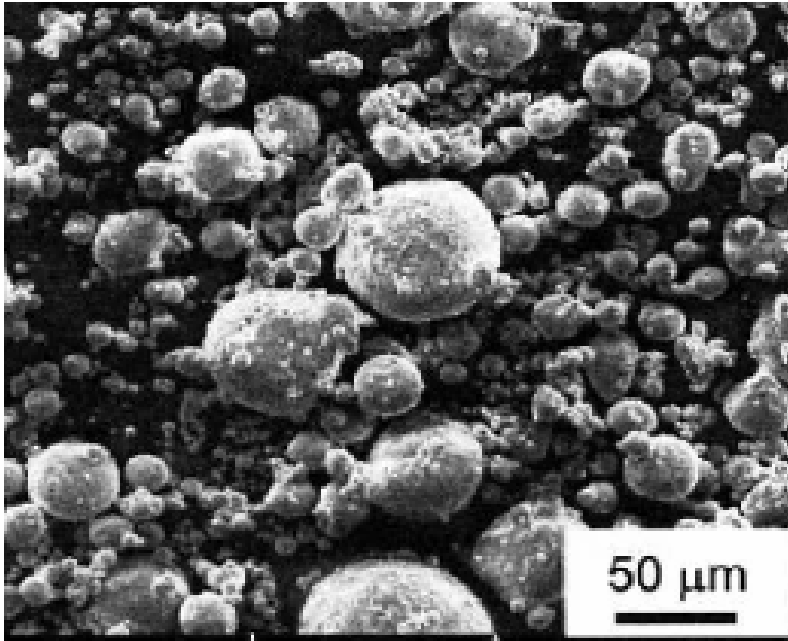


Summary:

- novel approach of using high energy mill technology looks to be promising for the production of NiCrAlY powder with fine grain size and equiaxed morphology
- need to further optimize milling prior to thermal spraying and testing in TBC



5083 Al Powder

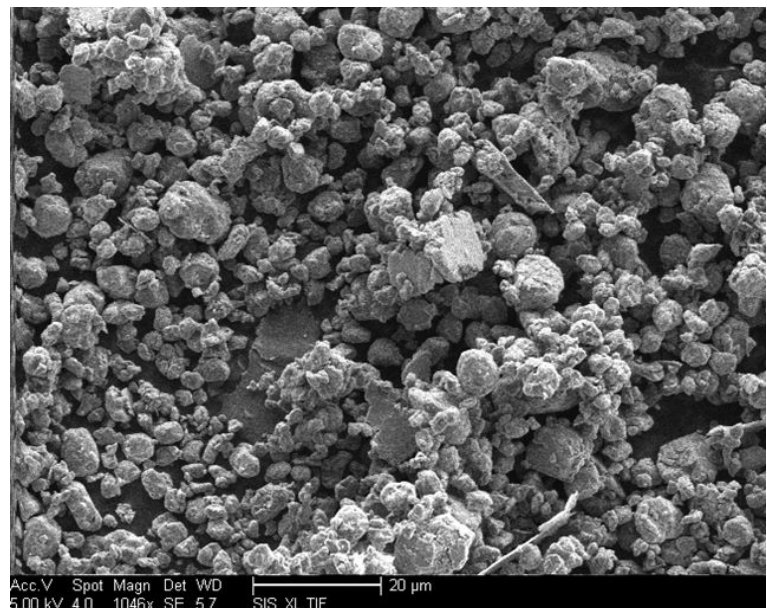


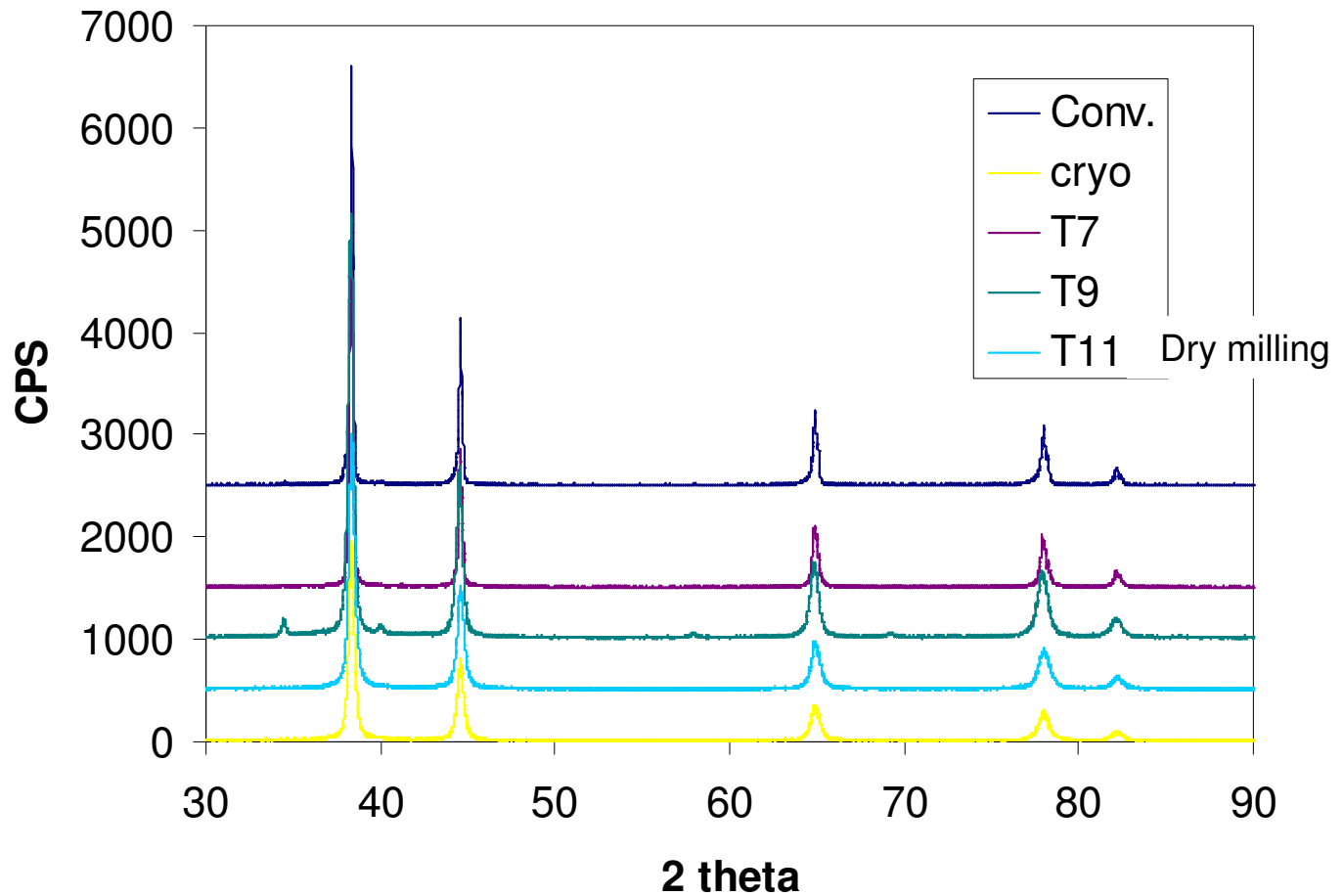
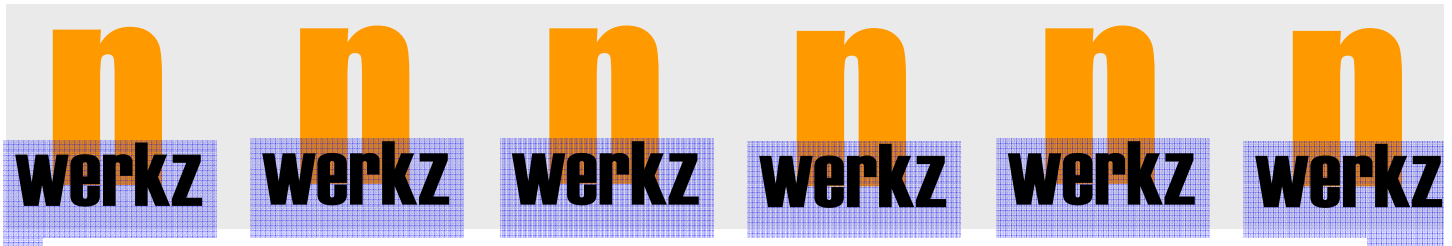
original powder

(spherical atomized powder)

Note: micrograph from similar powder used by UC, Davis

proprietary milling
without LN2 (uniform equiaxed
particles that can be produced at much
lower cost and faster rate than via
cryomilling)





Summary:

- novel approach of using high energy mill technology has produced Al5083 powder with fine grain size and equiaxed morphology
- bulk samples will be formed and mechanical testing carried out
- novel approach is cheaper and faster in producing fine-grained particles, as compared to cryomilling