quenched from the austenitic field (1075 °C) with a cooling rate of 3600 °C/minute and annealed at increasing time at 700 °C up to 18 hours.
Cr segregation has been observed not only in the probes broken in brittle (quasi-cleavage) mode but also after ductile fracture. The unexpected result indicates that Cr segregation weakens the atomic bonds thus the fracture path in both the cases corresponds to the zones with higher Cr content.

174 Mechanical stimulation of cells for non-viral gene delivery

Nina Bono, Federica Ponti, Diego Mantovani, Gabriele Candiani
Dept. Chemistry, Materials and Chemical Engineering "Giulio Natta", Politecnico di Milano, Milan

The main challenge of non-viral gene delivery is the design of effective and non-cytotoxic vectors and tools capable of targeted delivery of genetic material to intended sites to alter cellular function and/or structure (Pezzoli et al., 2012).Since their introduction, chemical vectors - cationic carriers able to self-assemble with anionic nucleic acids (NAs) into particles (complexes) in order to overcome cellular barriers - and physical methods - the application of membrane-disruptive forces to ease the NAs intracellular delivery - have made strides forward (Mehier-Humbert and Guy, 2005; Tros de Ilarduya et al., 2010). However, the poor efficiency of the former and the risk of potential cell damage of the latter are hampering their widespread application.
In this context, we propose a novel *in vitro* gene delivery strategy relying on the delivery of polyethylenimine (PEI)-based polyplexes to mechanically stimulated cells, with the aim of easing the internalization of the genetic cargo, thus improving their transfection efficiency (TE). Specifically, high-frequencies vibrations (100 Hz) or cyclic deformation (10% cyclic strain) were used to induce a transient cell membrane destabilization in order to promote cell/complexes interactions thus increasing the uptake and the transgene expression. In our hands, when cells were properly stimulated, we observed a 10-to-100 fold-increase in TE of PEI/based polyplexes with respect to unstimulated transfected cells, with no effect on cell viability.
Overall, coupling the use of a physical method with chemical vectors demonstrated to be an interesting technology to investigate the potential to drive effective gene transfer under well-defined mechanical environment.

175 High purity magnetite microparticles directly derived from mill scale via hydrogen-reduction method

Autchariya Boontanom, Piyada Suwanpinij
The Sirindhorn International Thai-German Graduate School of Engineering, Bangkok, Thailand

This study develops the fast and simple way to produce high purity magnetite (Fe_3O_4) microparticles from mill scale by using hydrogen reduction with the addition of vapour as a retarding agent. By optimising the reduction temperature and gas flow rate, the characterisations by X-ray diffractometry technique showed that the Fe_3O_4 fraction of over 93wt.-% are shown at the reduction temperature of 550 – 650 ºC with the flow rate of the 4.5-5.5 mol%H_2 + Ar gas + H_2O vapour gas mixture from 100 – 200 ml/minute. The highest Fe_3O_4