How can the reverse miceller reaction be controlled to yield the desired nanoparticles?

Typical 'reverse micelle' system consists of the following three ingredients:

1. Continuous phase: Organic solvents like cyclohexane or iso-octane can be used as a continuous phase.
2. Dispersed phase: Aqueous solution of reactants in the form of droplets is used as a dispersed phase
3. Surfactants: Molecules with a small hydrophilic head and a long hydrocarbon tail
 (preferably branched) like sodium di-octyl sulfosuccinate (Na-AOT), Cetyl trimethyl ammonium bromide (CTAB), Alkyl phenol ethoxylates (Triton X-100) or Lecithin
(soyalicithin)

Factors influencing the droplet particle size:

- Concentration of the reactant solutions has a direct effect on the particle size and hence needs to be optimized to get the desired particle size.
- The ratio of concentration of water to surfactant i.e. [H2O] / [Na(AOT)] controls the particle size of the droplet. The larger the ratio, the larger will be the radius of the droplet. Thus for a given concentration of surfactant (which should be higher than the CMC), the particle size will increase linearly with the amount of aqueous phase in the system. Control of particle size from 4~20 nm with narrow distribution is reportedly achievable.

Factors affecting the water exchange process:

The kinetics of the water exchange process is governed by the size of the droplets, the inter-miceller distance and the affinity between the surfactant and the organic solvent. It has been reported that change of the solvent to a longer chain hydrocarbon accelerates the exchange process significantly. Further, the mixing procedure and the temperature will have their own impact on the process.
