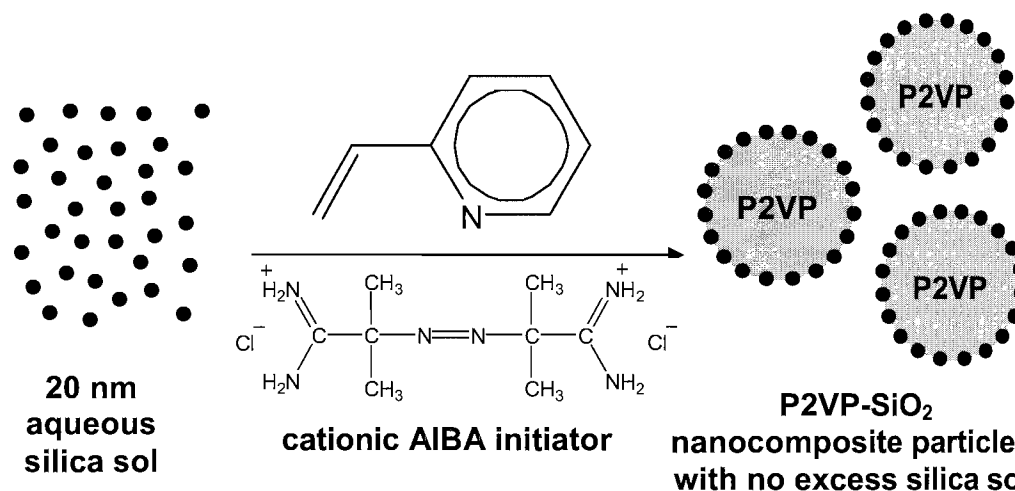


## Efficient Synthesis of Colloidal Poly(2-vinylpyridine)-Silica Nanocomposite Particles Using a Cationic Azo Initiator

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Contrary to theoretical predictions,<sup>1</sup> colloidal poly(2-vinylpyridine)-silica nanocomposite particles can be efficiently prepared by emulsion polymerisation at 60°C using a commercial 20 nm aqueous silica sol as the sole stabilising agent. Unlike previously reported colloidal nanocomposite syntheses<sup>2</sup>, transmission electron microscopy studies indicate very high silica aggregation efficiencies (88-99 %). The key to success is simply the selection of a suitable *cationic* azo initiator: in contrast, use of an anionic persulfate initiator leads to substantial contamination of the nanocomposite particles with excess silica sol. This cationic azo initiator is electrostatically adsorbed onto the anionic silica sol at submonolayer coverage, which suggests that surface polymerisation may be important for successful nanocomposite formation. Moreover, the 2-vinylpyridine can be partially replaced with either styrene or methacrylic comonomers to produce a range of copolymer-silica nanocomposite particles. Ultramicrotomy TEM studies confirm that the poly(2-vinylpyridine)-silica nanocomposite particles have a well-defined 'core-shell' morphology, with poly(2-vinylpyridine) cores and silica shells: diameters typically vary from 180 to 220 nm and the mean silica contents range from 27 % to 35 % by mass. These poly(2-vinylpyridine)-silica nanocomposite particles also behave as stimulus-responsive Pickering emulsifiers for various oils, similar to data reported by Fujii et al.<sup>3</sup> for the corresponding poly(4-vinylpyridine)-silica particles. Stable emulsions are obtained at neutral or basic pH, whereas lowering the solution pH below pH 4 causes demulsification, since the swollen microgel-like particles desorb from the oil droplet interface.



Schematic representation of the efficient synthesis of colloidal poly(2-vinylpyridine)-silica nanocomposite particles.

### References

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