Metallic nano carrier complex targeting neuroendocrine prostate cancer

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Introduction

Cancer treatment methods such as chemotherapy, radiation therapy, immunotherapy and hormone therapy have been used to treat cancers . These treatments affect cancerous as well as healthy tissues. Targeted drug delivery however can provide a focused approach to the treatment of cancers with the potential to eliminate the adverse side effects. This work follows from previous research conducted on synthesis of polymer encapsulated siRNA / iron oxide (Fe_3O_4) commercial nanoparticle complex in pilot study. The study highlighted extracellular drug release in relation to time and polymer composition of the pay loaded complex. Going forward, free standing Fe_3O_4 NPs (1 – 8 nM ø) soft landed on thin film, polymer-coated 4" ø silicon wafer have since been achieved. Physical vapour deposition (PVD) thin film sputtering via Mantis Nanogen Trio system was employed. Overall objective of this study is to synthesise a polymer / nanocarrier complex, pay - loaded with siRNA and with chemical properties suitable for intracellular targeted drug delivery in neuroendocrine prostate cancer (NEPC).

Methods

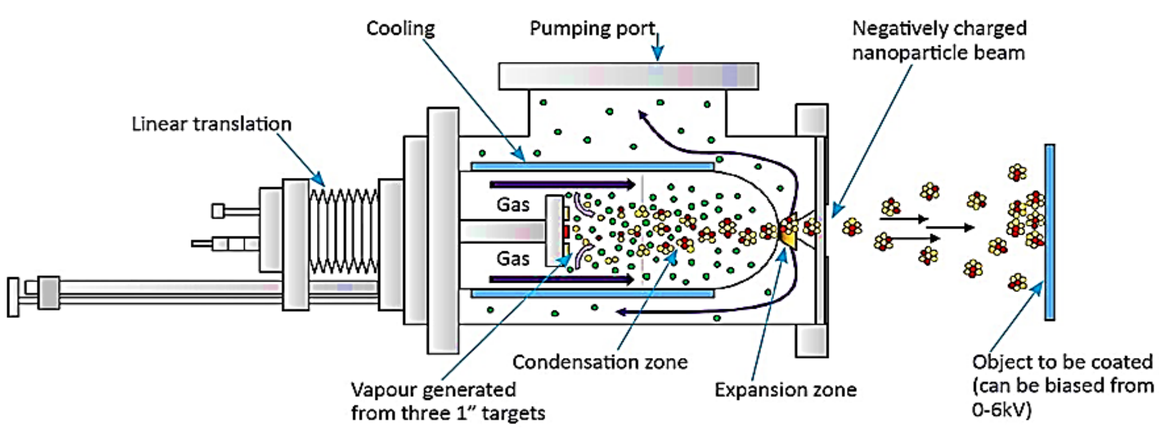

Fig. 1: Mantis Nanogen Trio system.

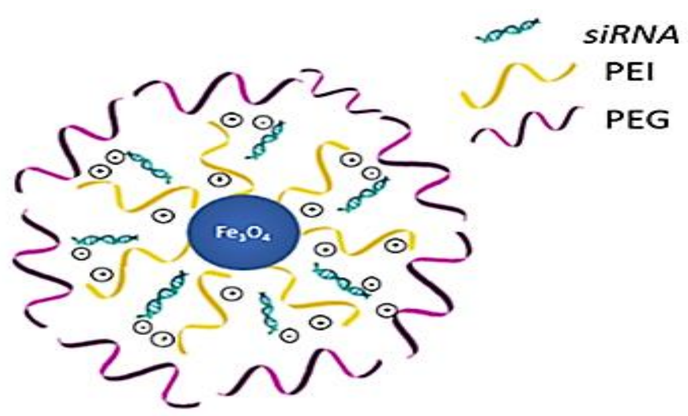

Fig. 2: PEGylated particle.

Results

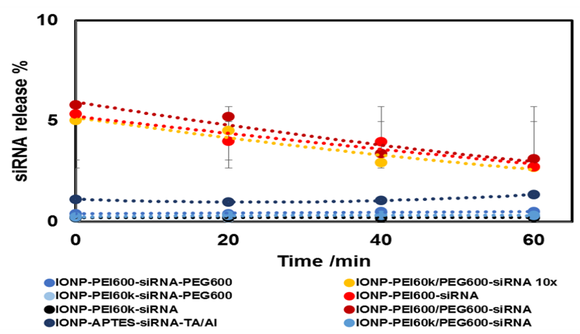

Fig.3: siRNA release studies (obtained during previous phase of project).

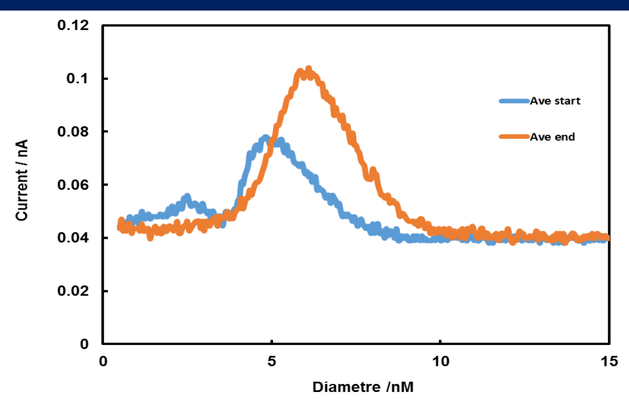

Fig. 4: Curve evolution pre and post sputtering.

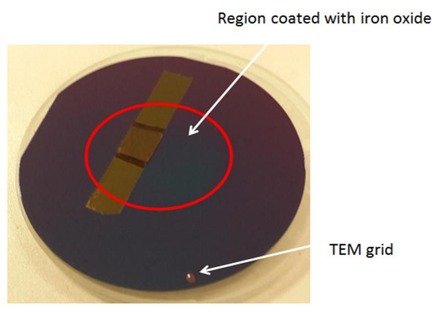

Fig. 5: Fe_3O_4 coating in centre of silicon wafer.

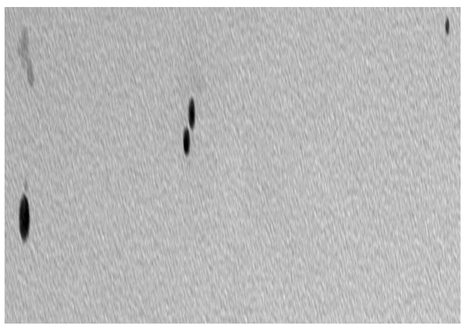

Fig. 6: TEM free-standing Fe_3O_4 NPs in water.

Conclusions

- PVD sputtered magnetite targets produce 1-8 nM ø NPs potentially suitable size for intracellular targeted delivery.
- Water soluble polymer allows suspension of particles.
- NP dispersion may be reduced by using 2" substrate.

Further work

- Development of protocols to assess siRNA release at different pH values (using suitable fluorescent markers).
- Effect of pH on siRNA release from polymer /nano carrier complex.
- Identification and attachment of receptor specific for cancerous cell membrane biomarker for targeted delivery.
- *In vitro* and *in vivo* testing at Open University.

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