On the Behavior of Small Collections of Magnetic Plasmonic Oligomers

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Abstract

Helen Frankenthaler.

Abbreviations

LSPR, MNP

Keywords

plasmon, magnetic plasmon

Introduction

Results and discussion

Outline

The document layout should follow the style of the journal concerned. Where appropriate, sections and subsections should be added in the normal way. If the class options are set

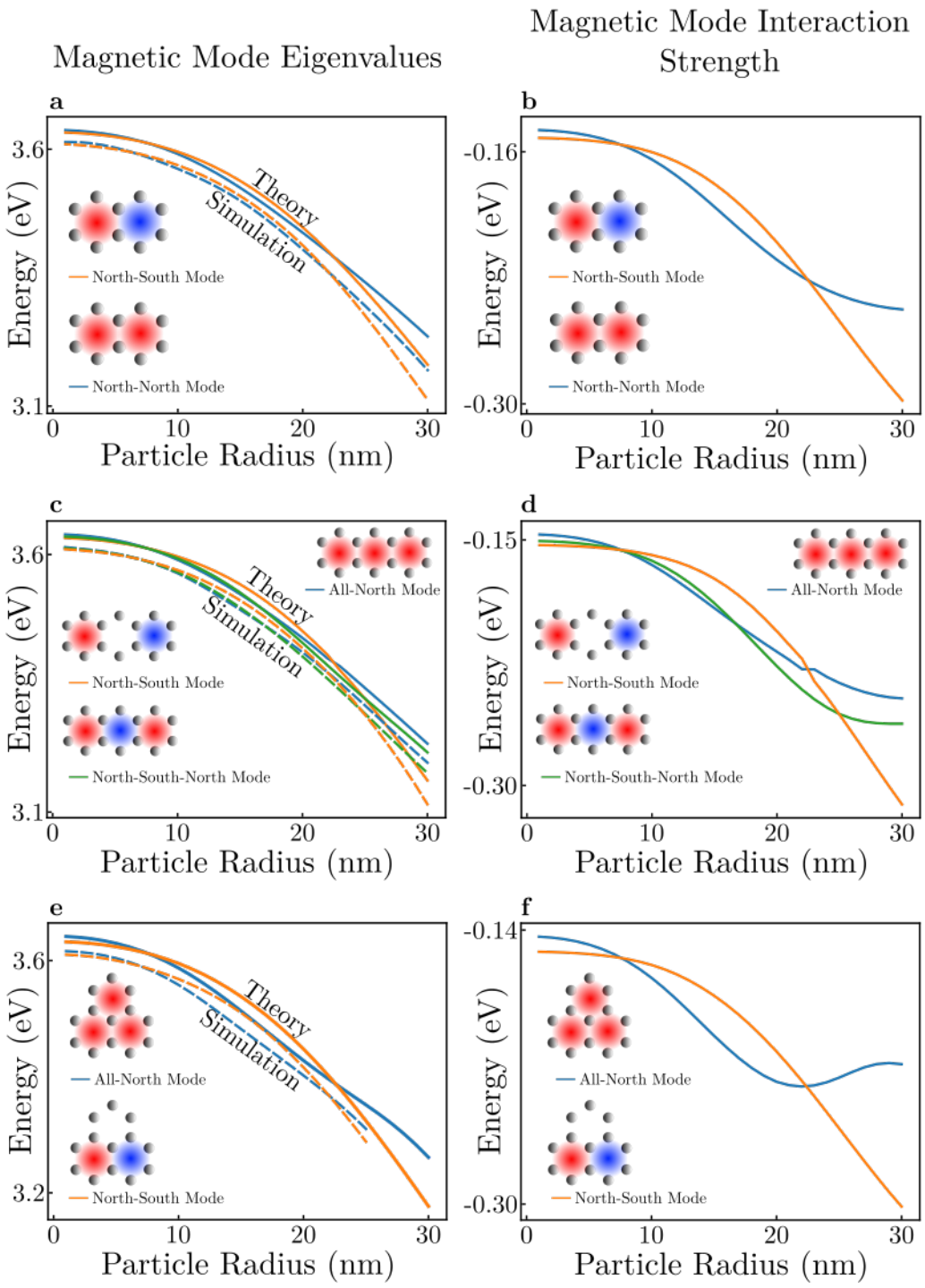

Figure 1: Magnetic mode eigenvalues, predicted and simulated, and interaction strengths for the magnetic twomer (a and b), threemer chain (c and d), and threemer ring (e and f). All of the magnetic modes range from 3.6 eV to 3.1 eV. In each system, the magnetic modes exhibit multiple crossings, showing that the eigenspectrum of these magnetic systems depends on their scale. The model consistently overestimates the eigenvalues by 0.5 eV, and consistently underestimates the crossing points by less than a nanometer. The twomer has two magnetic modes, one in-phase mode (a and b, blue trace) and one out-of-phase mode (a and b, orange trace). The threemer chain has three modes, an in-phase mode (c and d, blue trace), a minimally out-of-phase mode (c and d, orange trace), and a maximally out-of-phase mode (c and d, green trace). The threemer ring exhibits three magnetic modes, but

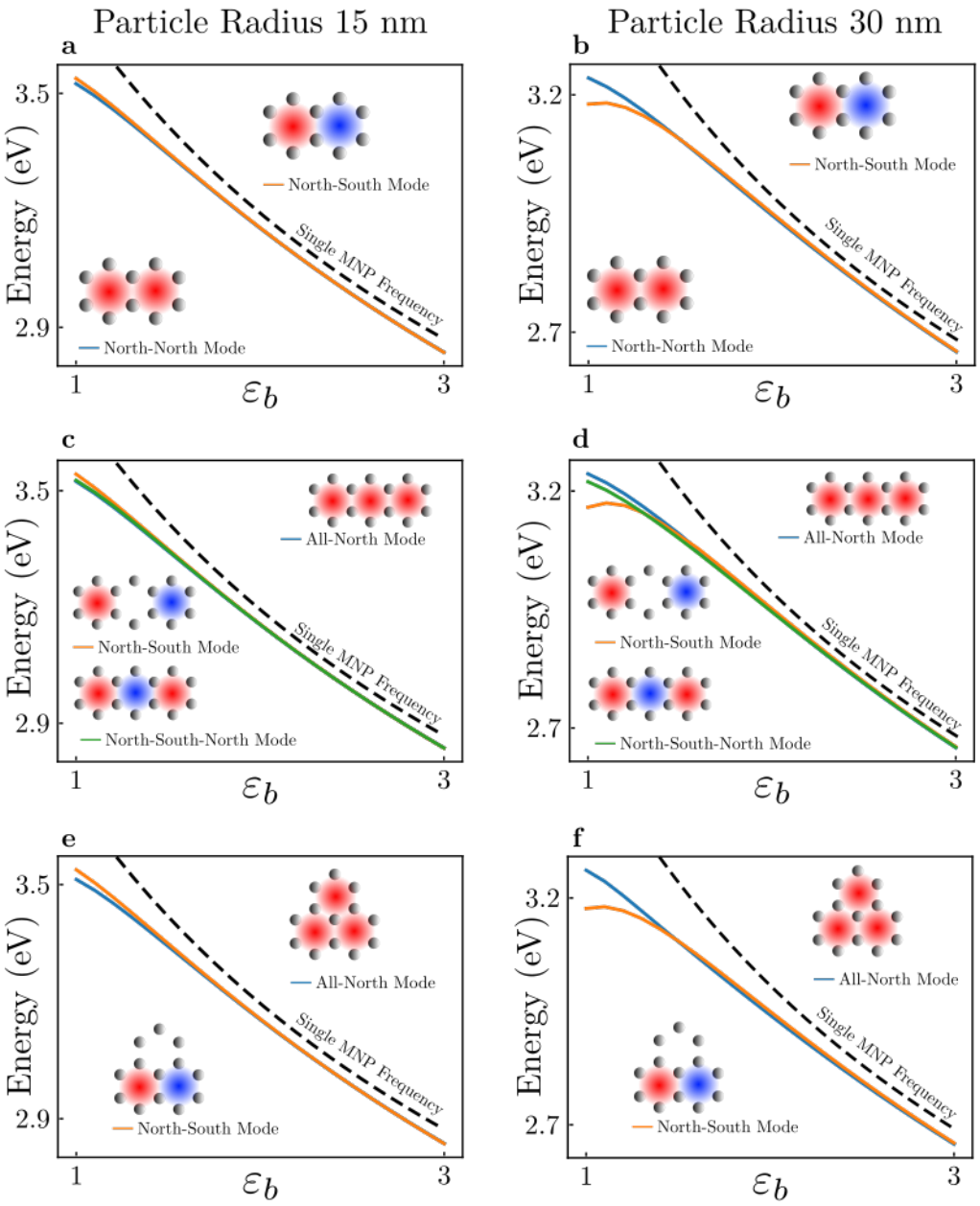

Figure 2: Magnetic mode eigenvalues for twomers (a and b), threemer chains (c and d), and threeemr rings (e and f) with particle sizes of 15 nm (first column) and 30 nm (second column) as a function of the dielectric constant of an embedding medium. As the dielectric constant is increased from 1 to 3, the magnetic mode splitting decreases and the overall energy decreases. At very high dielectric values, the magnetic mode eigenvalues converge to the single particle resonance frequency. This can be explained by the increasing opacity of the medium effectively screening inter-particle interactions. It is also important to note that between $\varepsilon_b = 1$ and $\varepsilon_b = 1.5$, the magnetic modes flip order. Thus, the increasing opacity of the medium effectively decreases the scale of the system.

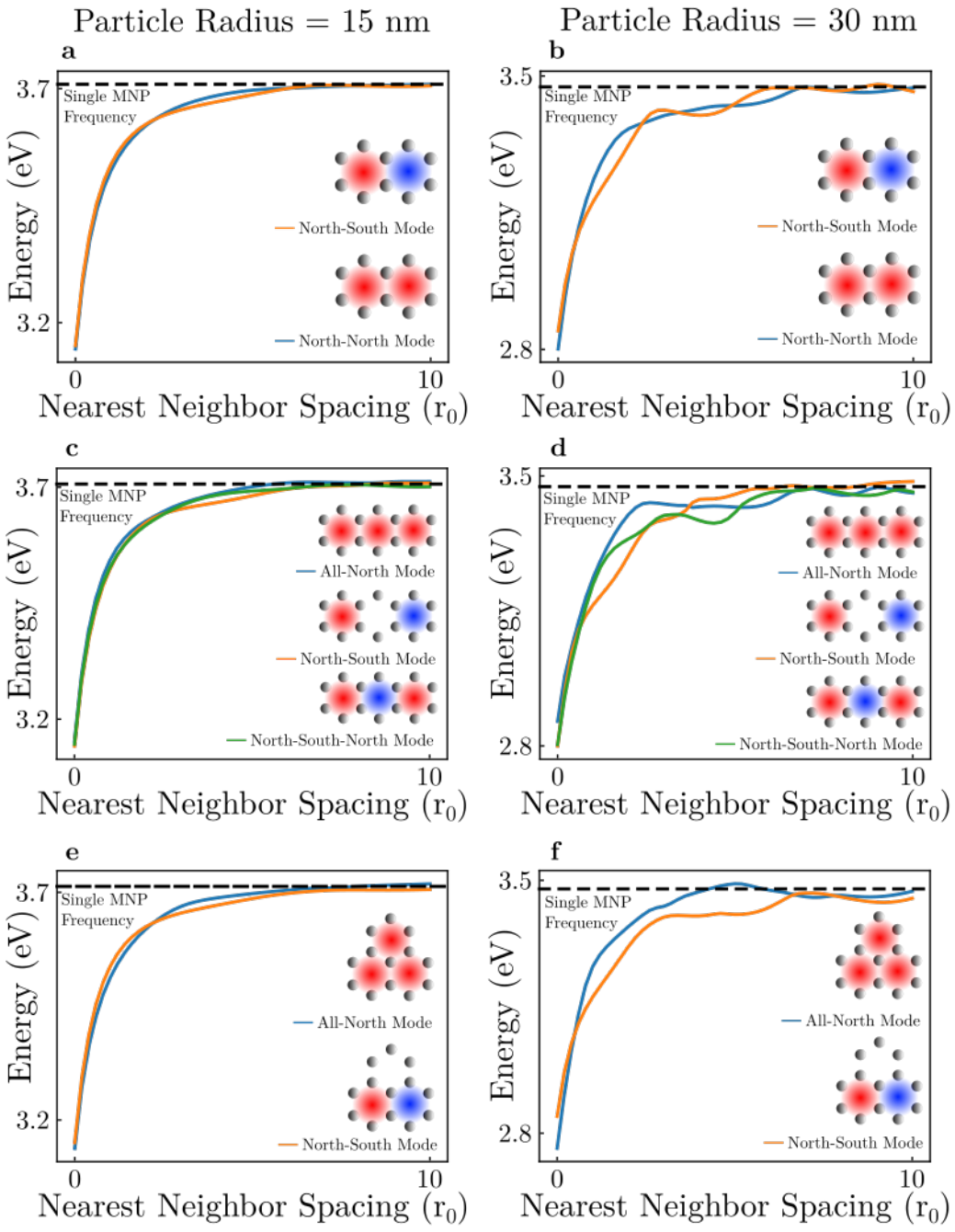

Figure 3: Magnetic mode eigenvalues for twomers (a and b), threemer chains (c and d), and threemer rings (e and f) with particle sizes of 15 nm (first column) and 30 nm (second column) as a function of nearest neighbor particle spearation. The separation is plotted as a function of the particle size, in units of radii. It is important to note that as the separation distance increases, the magnetic modes cross multiple times and their eigenvalues converge to, and oscillate about the single particle frequency. This is a result of the decreasing interaction strength. In the limit of particles infinitely far away from each other, their interaction stength is zero. The oscillating nature of the eigenvalues is a result of the complex exponential dependence of the fields.

correctly, warnings will be given if these should not be present.

References

The class makes various changes to the way that references are handled. The class loads natbib, and also the appropriate bibliography style. References can be made using the normal method; the citation should be placed before any punctuation, as the class will move it if using a superscript citation style.[?] [?] [?] [?] The use of natbib allows the use of the various citation commands of that package: **?** have shown something, in **?**, or as given by Ref. **?** . Long lists of authors will be automatically truncated in most article formats, but not in supplementary information or reviews.[?] If you encounter problems with the citation macros, please check that your copy of natbib is up to date. The demonstration database file `achemso-demo.bib` shows how to complete entries correctly. Notice that "*et al.*" is auto-formatted using the `\latin` command.

Multiple citations to be combined into a list can be given as a single citation. This uses the mciteplus package.[?] Citations other than the first of the list should be indicated with a star. If the mciteplus package is not installed, the standard bibliography tools will still work but starred references will be ignored. Individual references can be referred to using `\mciteSubRef`: "ref. **??**".

The class also handles notes to be added to the bibliography. These should be given in place in the document.[?] As with citations, the text should be placed before punctuation. A note is also generated if a citation has an optional note. This assumes that the whole work has already been cited: odd numbering will result if this is not the case.[?]

Floats

New float types are automatically set up by the class file. The means graphics are included as follows (Scheme 1). As illustrated, the float is "here" if possible.

Charts, figures and schemes do not necessarily have to be labelled or captioned. However,

Your scheme graphic would go here: `.eps` format
for LaTeX or `.pdf` (or `.png`) for pdfLaTeX
ChemDraw files are best saved as `.eps` files:
these can be scaled without loss of quality, and can be
converted to `.pdf` files easily using `eps2pdf`.

Scheme 1: An example scheme

As well as the standard float types `table`
and `figure`, the class also recognises
`scheme`, `chart` and `graph`.

Figure 4: An example figure

tables should always have a title. It is possible to include a number and label for a graphic without any title, using an empty argument to the `\caption` macro.

The use of the different floating environments is not required, but it is intended to make document preparation easier for authors. In general, you should place your graphics where they make logical sense; the production process will move them if needed.

Math(s)

The achemso class does not load any particular additional support for mathematics. If packages such as amsmath are required, they should be loaded in the preamble. However, the basic LaTeX math(s) input should work correctly without this. Some inline material $y = mx + c$ or $1 + 1 = 2$ followed by some display.

$$A = \pi r^2$$

It is possible to label equations in the usual way (Eq. 1).

$$\frac{\mathrm{d}}{\mathrm{d}x} r^2 = 2r \tag{1}$$

This can also be used to have equations containing graphical content. To align the equation

number with the middle of the graphic, rather than the bottom, a minipage may be used.

As illustrated here, the width of
the minipage needs to allow some (2)
space for the number to fit in to.

Experimental

The usual experimental details should appear here. This could include a table, which can be referenced as Table 1. Notice that the caption is positioned at the top of the table.

Table 1: An example table

Header one	Header two
Entry one	Entry two
Entry three	Entry four
Entry five	Entry five
Entry seven	Entry eight

Adding notes to tables can be complicated. Perhaps the easiest method is to generate these using the basic `\textsuperscript` and `\emph` macros, as illustrated (Table 2).

Table 2: A table with notes

Header one	Header two
Entry one[a]	Entry two
Entry three[b]	Entry four

[a] Some text; [b] Some more text.

The example file also loads the optional mhchem package, so that formulas are easy to input: `\ce{H2SO4}` gives H_2SO_4. See the use in the bibliography file (when using titles in the references section).

The use of new commands should be limited to simple things which will not interfere with the production process. For example, `\mycommand` has been defined in this example, to give italic, mono-spaced text: *`some text`*.

Extra information when writing JACS Communications

When producing communications for *J. Am. Chem. Soc.*, the class will automatically lay the text out in the style of the journal. This gives a guide to the length of text that can be accommodated in such a publication. There are some points to bear in mind when preparing a JACS Communication in this way. The layout produced here is a *model* for the published result, and the outcome should be taken as a *guide* to the final length. The spacing and sizing of graphical content is an area where there is some flexibility in the process. You should not worry about the space before and after graphics, which is set to give a guide to the published size. This is very dependant on the final published layout.

You should be able to use the same source to produce a JACS Communication and a normal article. For example, this demonstration file will work with both `type=article` and `type=communication`. Sections and any abstract are automatically ignored, although you will get warnings to this effect.

Acknowledgement

Please use "The authors thank ..." rather than "The authors would like to thank ...".

The author thanks Mats Dahlgren for version one of achemso, and Donald Arseneau for the code taken from cite to move citations after punctuation. Many users have provided feedback on the class, which is reflected in all of the different demonstrations shown in this document.

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Inside the `tocentry` environment, the font used is Helvetica 8 pt, as required by *Journal of the American Chemical Society*.
The surrounding frame is 9 cm by 3.5 cm, which is the maximum permitted for *Journal of the American Chemical Society* graphical table of content entries. The box will not resize if the content is too big: instead it will overflow the edge of the box.
This box and the associated title will always be printed on a separate page at the end of the document.