

Successfully transitioning the world's largest chemistry subscription journal to a gold open access publication

In 2016 the Royal Society of Chemistry announced that from January 2017 it would convert *RSC Advances*, the world's largest chemistry journal, from a subscription journal to a gold open access journal. This article gives some background to the decision to convert, and provides an update on how the conversion to the new access model has gone during the first three months following conversion. The effect of the conversion on article submissions, including scientific topics covered and the geographical representation of the submitted articles, is also discussed.

Introduction

As a learned society and the UK's professional body for those working in the chemical sciences, everything we do at the Royal Society of Chemistry is focused on our mission – to advance excellence in the chemical sciences. One of our four charter objectives is 'to foster and encourage the growth and application of such science by the dissemination of chemical knowledge'. To this end, our publishing programme started in 1841 and has flourished into a successful, growing and dynamic international programme encompassing a portfolio of journals, books, chemical databases and our magazine *Chemistry World*.

Our goal is to operate in a sustainable way to meet the publishing needs of the chemistry community and our customers while continuing to reinvest all surplus back into the chemistry community. That surplus supports conferences and events, grants and bursaries, awards and prizes. It also enables us to support thousands of teachers and learners of chemistry, ensures chemistry's voice is influencing UK government policy and facilitates scientific partnerships and discovery internationally, including in the developing world.

Science publishers play two important roles in the research ecosystem. Most importantly, we help researchers share the best ideas and new knowledge in a transparent way that allows others to build on their work. But we also recognize that publishing is critical for individual professional development, particularly for researchers at the earlier stages of their careers. Scientists need to publish their work to advance in their careers, build their profile, make new connections and, crucially, attract and maintain funding.

Within our journals' programme our priorities are to grow the quality and breadth of our programme by engaging with and understanding our communities, provide librarians with the opportunity to ensure their users and readers achieve their professional aims, and drive the chemical sciences forward for science and humanity.

Our 44 individual journals complement each other to form subject-based portfolios that build relationships with our author and reader communities. In 2016 we published over 42,000 articles.



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'publishing is critical
for individual
professional
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RSC Advances

Around seven years ago, we had consistent and strong feedback from research communities that were developing their science infrastructures and from early-career researchers, saying that we did not provide an accessible journal in which they could publish their articles. Based on this feedback, we launched *RSC Advances*¹ in 2011 as a home for this type of work.

RSC Advances is an online journal that publishes high quality, well-conducted research that advances the development of the field. It has a broad scope and publishes across all the chemical sciences, with a particular focus on interdisciplinary research. It is now the biggest chemical science journal in the world in terms of number of articles published.

Our vision for the journal is to provide a quality society publishing option for all sections of our community, including emerging scientific areas and markets. The journal has a specific focus on supporting early-career researchers and researchers from nations which are developing their research base and encouraging new authors to publish with the Royal Society of Chemistry.

Our aim is to be innovative and inclusive, while maintaining quality. Our author service and support make the publication process as straightforward as possible for authors, and speed up the dissemination of their work. The process is article based, so that authors receive their page numbers (and therefore full citation) as soon as their article is accepted and their articles immediately go into the latest 'issue in progress'.

RSC Advances was launched as a subscription journal in 2011 and, to enhance its visibility within the community, we provided the first two volumes free of charge to all. From 2013 we provided access via an individual journal subscription or through a number of packages, including RSC Gold (our largest journal and databases package).

To ensure the journal's direct engagement with our community, peer review for the journal is managed by 200 Associate Editors (active researchers working in the field) based in 30 countries. In line with the journal's ethos, many of these are early-career researchers and are from nations with emerging scientific communities.

Our inclusive approach, focused on accessibility, helped *RSC Advances* to rapidly gain traction and a good reputation in the global community. Submissions and publications have grown significantly year on year (from 233 published articles in 2011 to 13,287 in 2016) as shown in Figure 1.

'supporting early-career researchers and researchers from nations which are developing their research base'

'we provided the first two volumes free of charge to all'

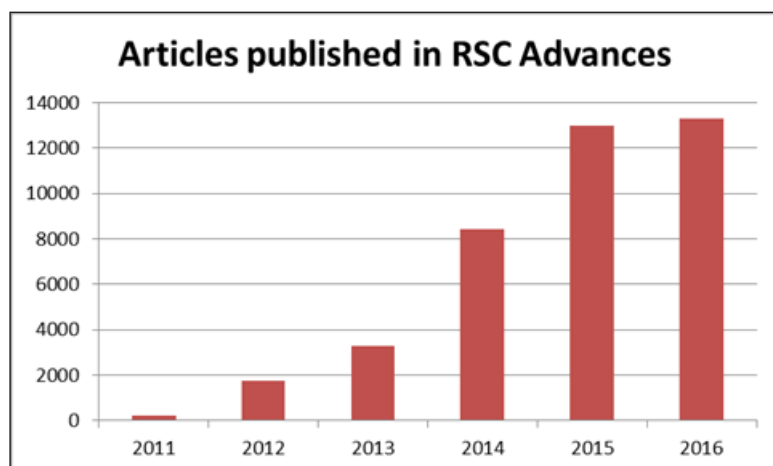


Figure 1. Number of articles published in *RSC Advances* from 2011 to 2016

40 The success, profile and reach of the journal exceeded all expectations. In 2016 we received submissions from over 90 countries, with over a third of these authors having never previously published with the Royal Society of Chemistry. The vast majority of submissions to *RSC Advances* are direct, while around 10% are transferred from our other journals. We have rigorous peer review standards to maintain the quality and reputation of the journal. The acceptance rate is in the region of 40% and the 2015 impact factor is 3.289.

The geographical distribution (Figure 2) and scientific topic coverage (Figure 3) indicate that the value of *RSC Advances* is recognized across the chemical sciences and is worldwide.

At the same time that *RSC Advances* was making its mark within the chemistry community, the way scientists communicate their research was evolving with the rise of open access (OA) publishing via both gold and green routes.

To set this in context, we briefly review the OA landscape below and drill down to examine changing attitudes and behaviours of chemical scientists towards OA publishing.

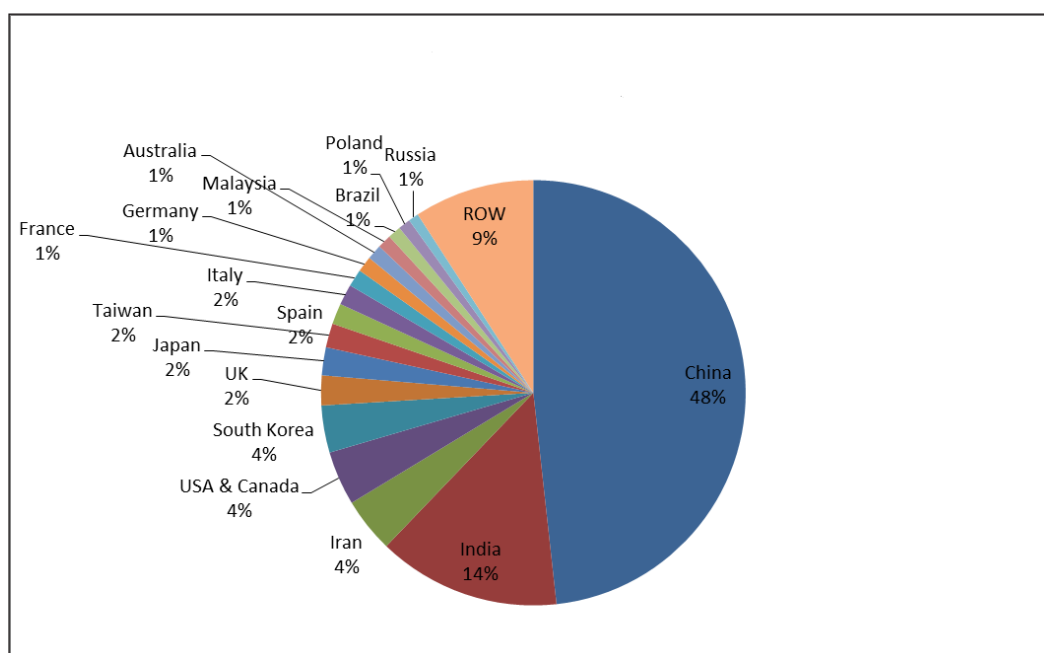


Figure 2. Country of origin of *RSC Advances* articles published in 2016

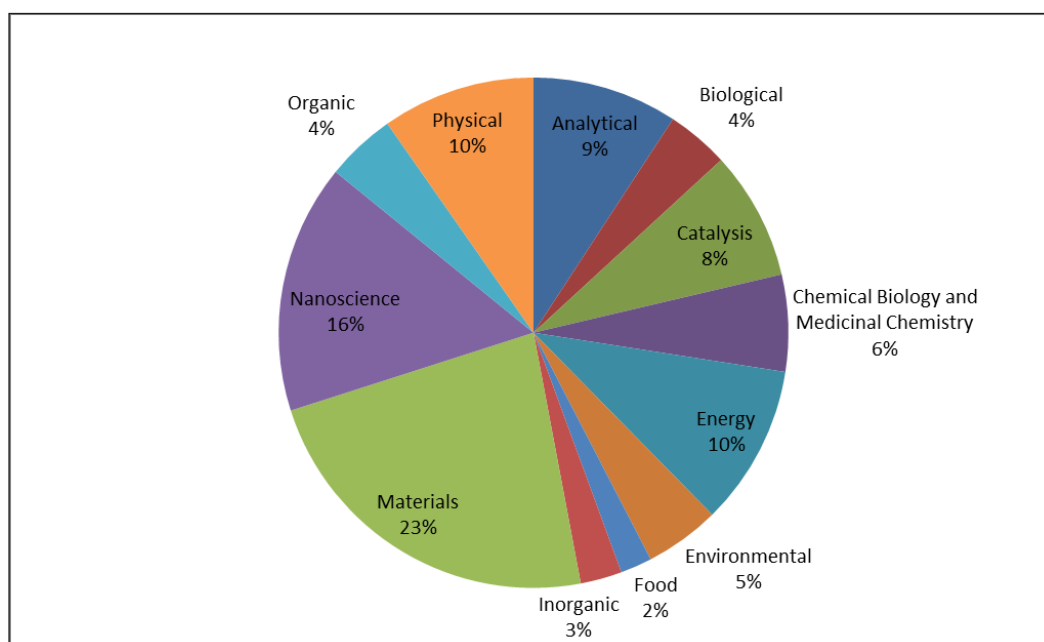


Figure 3. Scientific topic distribution of *RSC Advances* articles published between February 2016 and February 2017

The open access landscape

Estimates of the size of OA publishing vary somewhat, due to the complexities of definitions and measurement methodologies. However, it is clear that there is a strong upward trend in terms of article market share, with estimates of gold OA article growth being as high as around 30% a year between 2003 and 2011.²

Current estimates of total gold OA articles as a percentage of total scientific, technical and medical (STM) articles vary between 10.2%³ and 16.6%.⁴ Green OA articles as a percentage of total STM articles are estimated to be between 5.9%⁵ and 15%.⁶

One driver for increasing the amount of gold OA content available has been the incredible success of the so-called 'mega-journal'. Mega-journals are broad scope, online OA publications that operate a peer-review model that judges content to be scientifically sound, with no assessment of impact (known as 'objective' peer review).

The first mega-journal, *PLOS ONE*, was launched in 2006 and quickly became a leader in gold OA publishing. There are now more than 15 mega-journals in the STM market. The number of articles published in 11 established mega-journals reached over 44,820 in 2015, the majority of which appeared in *PLOS ONE* and *Scientific Reports*.⁷

Open access in the chemical sciences

The percentage of OA publishing by discipline varies widely. Studies and our own experience have shown that uptake by the chemistry community has been slower than in many other disciplines. A study by Björk et al., published in 2010, showed that chemistry had the lowest uptake of gold OA compared to other disciplines (Figure 4).⁸ A study published in 2015 showed that in 2014 the physical science and engineering community published 7% of its article output as gold OA articles, compared with 22% in the Health and Life Sciences community.⁹ Although lower than some other disciplines, the take-up of OA as a whole in chemistry has increased over the last few years.

'the take-up of OA as a whole in chemistry has increased over the last few years'

The enforcement of funding mandates marked a key turning point. Prior to that, there was relatively low OA compliance within the chemical sciences. For example, we introduced hybrid OA in our journal portfolio via article processing charges (APCs) in 2006. In 2012 only 0.2% of our articles were published in hybrid OA journals. (We had no gold OA journals at that time.) A combination of funding bodies introducing OA mandates and the introduction of our 'Gold for Gold' initiative resulted in a significant increase in the number

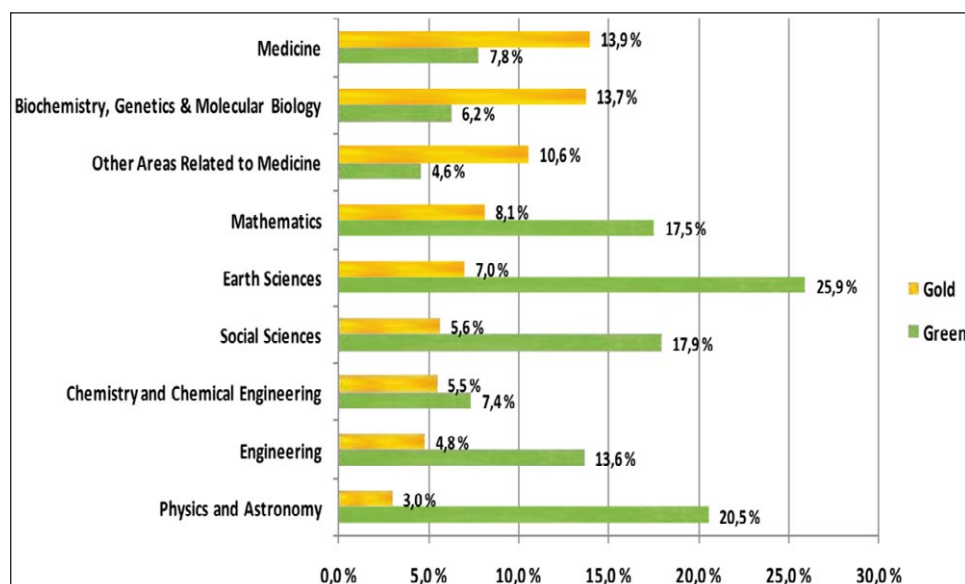


Figure 4. Percentage of articles published OA in 2008 by discipline (reproduced from Björk B-C et al.).¹⁰

42 of OA articles we published between 2012 and 2015, with the percentage of our content published via gold OA rising from 0.2% in 2012 (50 articles) to 10% (over 4,000 articles in 2016).

We introduced our Gold for Gold scheme to support our community in this funder-driven transition. The scheme provided subscription customers who purchased our largest subscription content package (Gold) with gold OA vouchers up to the value of their subscription package at no extra charge. Of the OA articles we published in 2015, 92% were supported by these vouchers.

We also saw a stark difference in author preference/behaviour according to geography across our portfolio. In 2016 papers from just two countries – Germany and the UK – made up almost half of our total gold OA article publications.

As OA has become more mainstream, more options have become available to the chemistry community. From 2006, most major chemistry publishers (Elsevier, Wiley, American Chemical Society and Royal Society of Chemistry) introduced a hybrid gold OA option in their journals.

Until recently there were a limited number of gold OA journals with established reputations within the discipline. This has now changed and in the 2014 *Journals Citation Report*[®] most chemistry categories contained OA journals (although in small numbers). In the Multidisciplinary Chemistry category there were 22 OA journals out of a total of 155.¹¹

Although there are now more OA journals available, the median impact factor for chemistry OA journals (in the Multidisciplinary Chemistry category) is 1.23, and only one journal in this category has an impact factor over three (a key metric for some authors). This compares with the median impact factor for chemistry journals of 1.769, so chemistry OA journals tend to have lower impact factors than chemistry hybrid journals.

'chemistry OA journals tend to have lower impact factors than chemistry hybrid journals'

This lack of OA journals publishing high quality, must-read content is changing. Certain sub-fields of chemistry are now served by specialist OA publications that have established strong reputations within the community and this has been translated into the size of the journal and its impact factor. These include the *Beilstein Journal of Organic Chemistry* (which is fully funded by the Beilstein Institute and does not levy any APCs) and Springer Nature's *Journal of Cheminformatics*.

Increasingly, publishers with a strong reputation in the field are also introducing broader chemistry OA journals and experimenting with a variety of funding models. These include *ACS Central Science* (fully funded by the American Chemical Society), *ACS Omega* (launched in March 2015 with APCs) and *ChemistryOpen* (co-owned by 16 European chemistry societies and Wiley, which also publishes it). In addition to these specific titles, a number of OA mega-journals publish chemical science research, such as *Scientific Reports* (Springer Nature) and *PLOS ONE* – which published around 5,000 chemistry articles in 2014.

Royal Society of Chemistry and open access

As a learned society and professional body, we want the research we publish to reach the widest possible audience and support all sustainable models of access. One model is gold OA, and we want to support and inform our community during the transition to a more open research environment by taking a lead and shaping OA publishing in the chemical sciences.

'we want the research we publish to reach the widest possible audience'

In 2015 we converted our flagship journal *Chemical Science* to an OA journal and waived the APCs, allowing authors to publish for free and enabling everyone to access the cutting-edge science it publishes. The following year we entered into collaboration with the Royal Society on their journal *Royal Society Open Science*. We are managing the journal's chemistry

43 section by commissioning articles and overseeing the peer-review process. The journal was launched in 2014 and is currently waiving its APCs. Our commitment and support for OA can be evidenced by the increase in OA articles that we have published, both via *Chemical Science* (the journal publishes over 500 articles per year) and via our hybrid journals programme, which published over 4,000 OA articles in 2016, the majority supported by the Gold for Gold scheme.

Finally, we have just taken the step of converting *RSC Advances*, the largest chemistry journal in the world, from a subscription model to gold OA.

Deciding to make *RSC Advances* gold OA

The decision to make *RSC Advances* gold OA involved a number of interconnected considerations.

The scholarly communications ecosystems are changing and evolving and a variety of drivers have established OA publishing as a normal part of how researchers communicate their ideas and results. Therefore it is important that we provide our community with OA journals and options to fulfil this need and requirement.

We believe that transitioning a trusted journal with well-established and mature editorial practices will greatly enhance the chances of a successful conversion and further positively influence our community in terms of establishing OA publishing practices.

The increasing support of OA within our community, led by ourselves and other publishers, is now evident. In addition, the wider scientific community supports and 'trusts' well-established mega-journals. Although we do not view *RSC Advances* as a mega-journal, because it does not operate an 'objective' peer-review process, it is of a comparable size and scope. This increasingly mature market therefore gave us confidence that now would be the right time to transition the journal.

To further support the transition to a more open research environment and as a benefit to our community, we have set one of the lowest APCs in the industry. We are also offering a wide range of discounts and waivers. (See below for more details.)

Taking these factors into account, we decided to transition the journal from a subscription journal to an OA journal supported by APCs. We announced the change in July 2016 and from 3 October 2016 all articles submitted to the journal were required to pay an APC upon acceptance. The journal was removed from our 2017 RSC Gold subscription package.

'we decided to transition the journal from a subscription journal to an OA journal supported by APCs'

Article processing charges

We are keen to maintain the inclusive ethos of *RSC Advances* and to continue to give early-career researchers and researchers from developing nations from around the world the opportunity to publish quality research in a respected journal with global reach. We have set APCs at a competitive level of £750 to ensure it is affordable to all authors and, for the first two years (2017 and 2018), these will be discounted to £500 for all authors. As with our hybrid journals, we offer a full waiver of the APC to researchers in more than 40 countries in the developing world (as defined by the Research4Life initiative)¹² with a partial discount to £250 available to six further countries, including India.

'we offer a full waiver of the APC to researchers in more than 40 countries'

What happened?

Authors were required to pay APCs from 3 October 2016, which was the date after which submissions to the journal would be published OA (if accepted). In the months leading up to this date, we communicated extensively with our community, in particular previous *RSC Advances* authors, to ensure that they heard messages about the conversion to

44 OA.¹³ The submission data for the journal just before and after this date show that the community were aware of the change. After a sharp rise in the week before the conversion date, submissions fell to around half the 'pre-flip' level and have remained at this level consistently from week to week. Importantly, the composition of the submitted articles in terms of scientific topics is similar in the months prior to the conversion and after the conversion, as is the quality of the articles being submitted (Figure 5). To date the rejection rates are similar for articles submitted before and after the change, and there are only minor changes to the composition of the geographical regions (Figure 6).

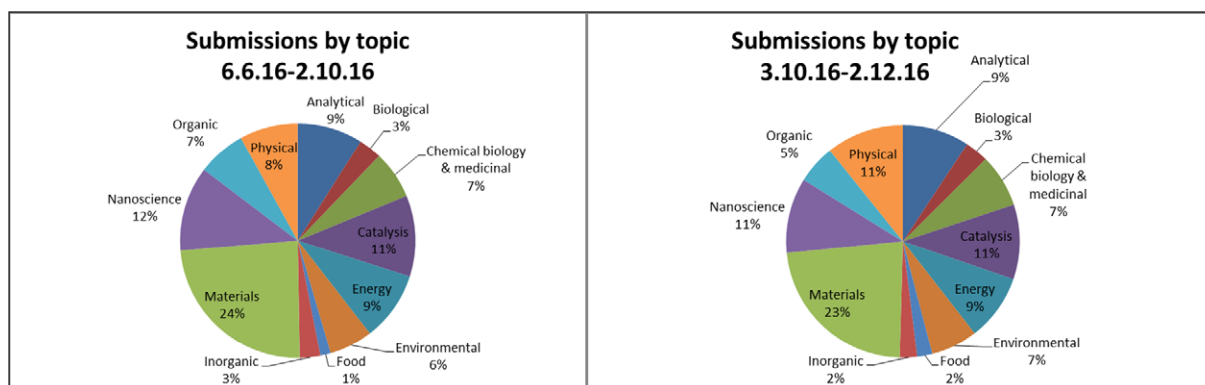


Figure 5. Submissions by scientific topic before and after the journal transitioned to OA

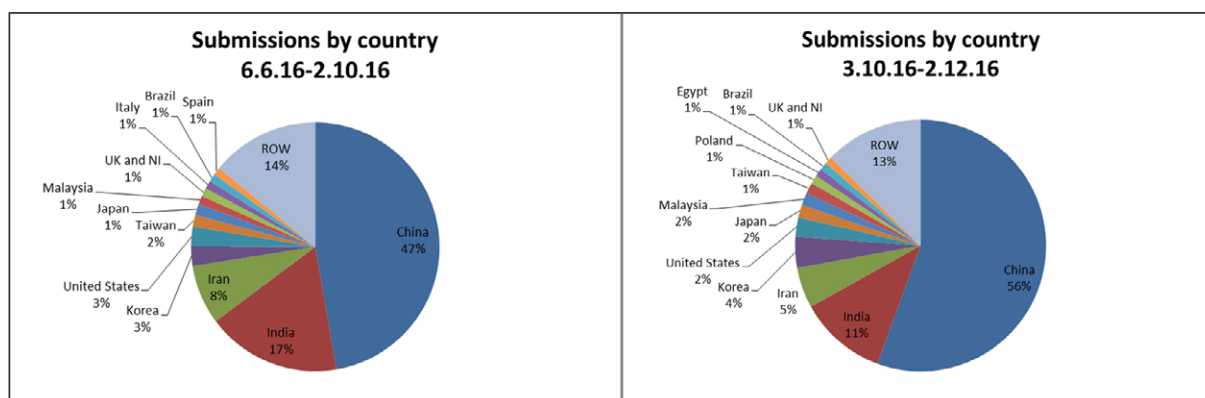


Figure 6. Submissions by country before and after the journal transitioned to OA. (The 'rest of the world' [ROW] section is made up of 71 countries and 50 countries, respectively)

From 3 October 2016 to 30 January 2017 we accepted 1,308 articles for publication and published the first OA issue of the journal on 6 January 2017. From the submission and publication data that we have, we can extrapolate that the journal will publish in the region of 7,000 articles in 2017. While this would be a decrease compared with the number of articles published in 2016, the journal would, at this size, maintain its position as the largest chemical science journal. Based on other publisher experience, we anticipate that submissions will rise to pre-conversion rates over time; however, it is difficult to estimate how long this will take. It is expected that the usage of the journal articles will increase due to the change to OA, showing that the authors' work will be disseminated to the widest audience possible (though it is too early yet to capture this data).

'we anticipate that submissions will rise to pre-conversion rates over time'

Conclusions

Our aim is to shape the future of OA publishing in the chemical sciences, and to support our author community through the transition to a more open research environment. With the conversion of *RSC Advances*, the largest chemical science journal, to OA, the Royal Society of Chemistry has introduced a successful, affordable OA publishing option for authors,

'it is possible ... to convert a large and growing subscription journal to an OA journal quickly, with little disruption'

45 which has a sustainable and scalable publishing model. Our experience has shown that it is possible, where the market and community conditions are favourable, to convert a large and growing subscription journal to an OA journal quickly, with little disruption for authors and readers.

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Abbreviations and Acronyms

A list of the abbreviations and acronyms used in this and other *Insights* articles can be accessed here – click on the URL below and then select the 'Abbreviations and Acronyms' link at the top of the page it directs you to: <http://www.uksg.org/publications#aa>

Competing interests

The authors have declared no competing interests.

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