AstroPAH

A Newsletter on Astronomical PAHs

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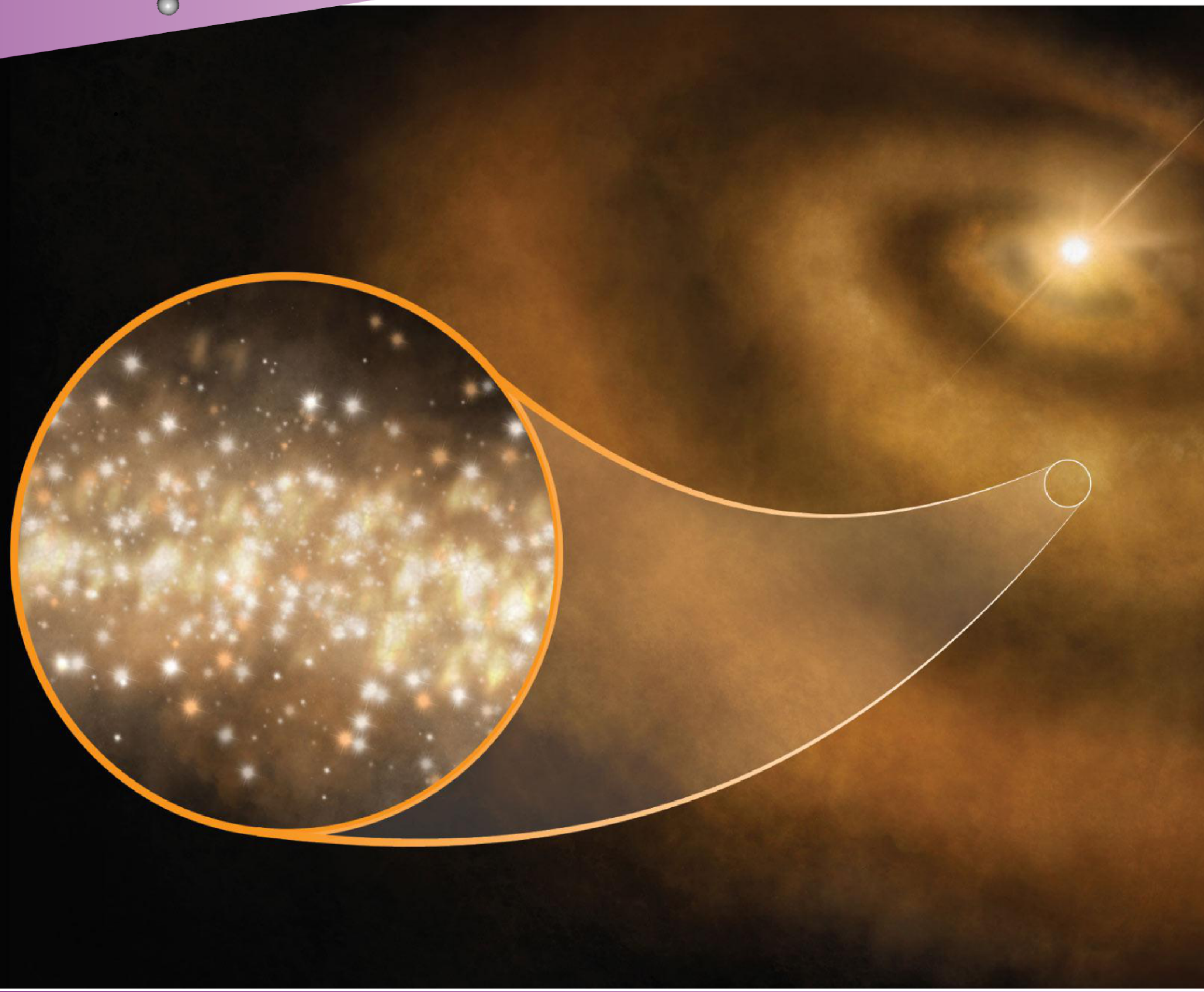

Editorial

Dear Colleagues,

We begin this June issue with excellent news for the entire field of astrochemistry. On 31 May 2018, the **Kavli Prize for Astrophysics** was awarded to Ewine van Dishoeck for her pioneering work that contributed to a breakthrough of astrochemistry.

We congratulate Prof. Ewine van Dishoeck, for this well deserved acknowledgment of her work!

More exciting news is revealed in the Picture of the Month. Featured on the cover is the ground-breaking discovery published in Nature Astronomy of rotating nano-diamonds as source of the anomalous microwave emission that has been a mystery for decades.

You can find the corresponding paper abstract as well as other abstracts on exciting research further in the newsletter. Clearly, great advancements are being made. Many also lie ahead of us. In Focus this month is an update on the highly anticipated JWST ERS Program ID1288 which concerns observations of photodissociation regions. In the In Focus section the core team members offer us the latest news and status on this ERS program.

We would like to remind everyone to fill out **our survey** for our 5th anniversary too.

Also coming up are quite a few important meetings, from specialised to more general, none the least the IAU General Assembly in Vienna, for which Ewine is president elect, with a meeting of the Laboratory Astrophysics Commission.

As always, do not forget to send us your contributions! For publication in the next AstroPAH, see the deadlines below.

The Editorial Team

Next issue: 19 July 2018.
Submission deadline: 6 July 2018.

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PAH Picture of the Month

Artistic impression of diamond dust around a protoplanetary disk. See Greaves et al. 2018 in the Abstract section.

Credits: S. Dagnello

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Newsletter Design: Isabel Aleman
Background image: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

AstroPAH Needs Your Feedback!

In preparation for our 5^{th} anniversary celebration, we ask for some feedback from you, our readers and contributors.

Please take a moment to answer a quick survey. Your feedback will help us improve AstroPAH and how it serves our community.

Click here to answer the survey.

Thank you!

The Editors

In Focus

JWST ERS Program ID1288:

Radiative feedback from massive stars as traced by multiband imaging and spectroscopic mosaics.

by Els Peeters, Olivier Berné, Emilie Habart & ERS-PDR team

Massive stars disrupt their natal molecular cloud material by dissociating molecules, ionizing atoms and molecules, and heating the gas and dust (Fig. 1a,b). These processes drive the evolution of interstellar matter in our Galaxy and throughout the Universe from the era of vigorous star formation at redshifts of 1-3, to the present day. Much of this interaction occurs in Photo-Dissociation Regions (PDRs, Fig. 1c) where far-ultraviolet photons from these stars create a largely neutral but warm region of gas and dust. PDR emission dominates the IR spectra of star-forming galaxies. It also provides a unique tool to rigorously study the physical and chemical processes that are relevant for most of the mass in inter- and circumstellar media including diffuse clouds, protoplanetary disk - and molecular cloud surfaces, globules, planetary nebulae, and starburst galaxies. The global PDR emission results from an intricate combination of physical, chemical and dynamical processes. Hence, it is essential to spatially resolve a PDR with high spectral resolution and large wavelength coverage to fully understand the underlying processes. This is of paramount importance to interpret more distant star-forming regions. JWST will resolve and directly observe, for the first time, the response of PDR gas to the penetrating far-ultraviolet (FUV) photons in its key zones: the ionization front and the H I/H_2 photodissociation front, at unprecedented spectral and spatial detail over the full 1-28 μm range.

The primary goals of this ERS program are:

- Obtain the first spatially resolved, high spectral resolution observations of a PDR with well-defined UV illumination in a typical massive star-forming region using NIRCam, NIRSpec and MIRI
- Provide template data and science-enabling products for PDRs
- Guide the preparation of Cycle 2 proposals on star-forming regions in our Galaxy and beyond

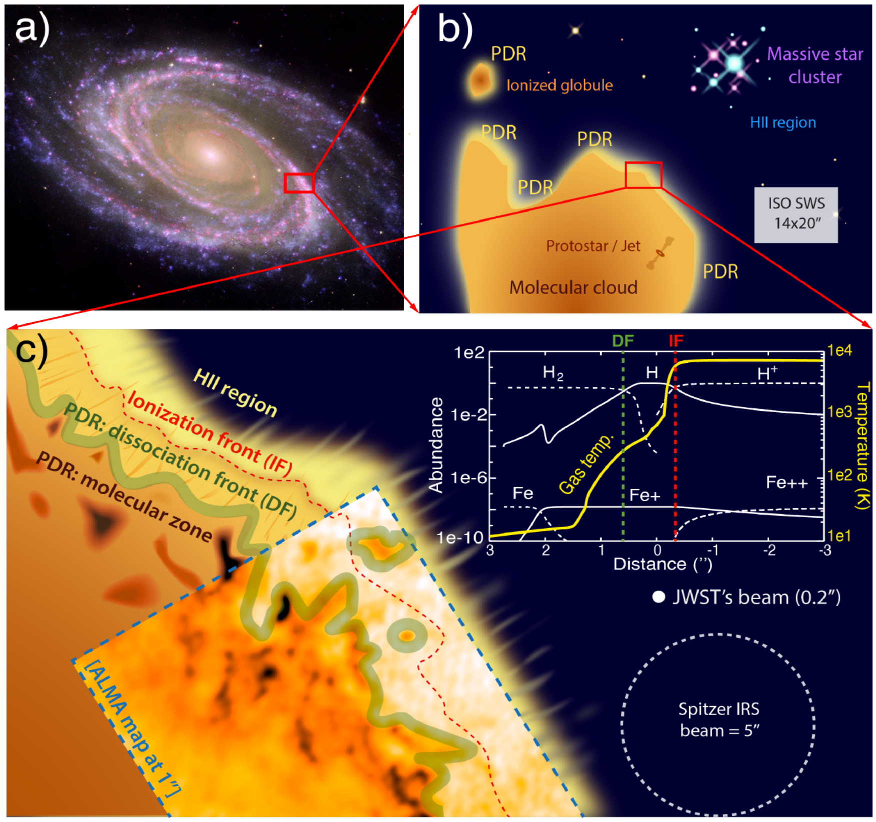

Figure 1: Zooming into a PDR. a) Multi-wavelength view of a Galaxy (M81): UV tracing massive stars (blue), optical light tracing H II regions (green), and PAH emission tracing PDRs (red). b) Sketch of a typical massive star-forming region (at a distance of 2 kpc). c) Zoom in on the PDR, showing the complex transition from the molecular cloud to the PDR dissociation front, the ionization front and the ionized gas flow. Inserted is the ALMA molecular gas data of the Orion Bar, at a resolution of 1" (dashed lines; Goicoechea et al., Nature, 2016). The inset shows a model of the structure of the PDR. The scale length for FUV photon penetration corresponds to a few arcsec. The beam sizes of ISO-SWS, Spitzer-IRS and JWST-MIRI are indicated. JWST will resolve the 4 key regions.

The Team

The philosophy of this ERS program has been, from the start, to be open to everyone with the objective to gather together the international community. Today, this has materialized into a large international and interdisciplinary team of 140 scientists from 18 countries. Figure 3 shows the detailed demographics. If you're interested in joining the team, register at **https://jwst-ism.org**.

The project is managed by three co-PIs (the PI team: O. Berné, E. Habart, E. Peeters) who will be responsible for overall coordination and for the distribution of the deliverables i.e. Data Products (DPs) and Science Enabling Products (SEPs). Both for coordination and delivery of DPs and SEPs, the PIs will be assisted by the core team (consisting of A. Abergel, E. Bergin, J. Bernard-Salas, E. Bron, J. Cami, S. Cazaux, E. Dartois, A. Fuente, J. Goicoechea, K. Gordon, Y. Okada, T. Onaka, M. Robberto, A. Tielens, S. Vicente, M. Wolfire).

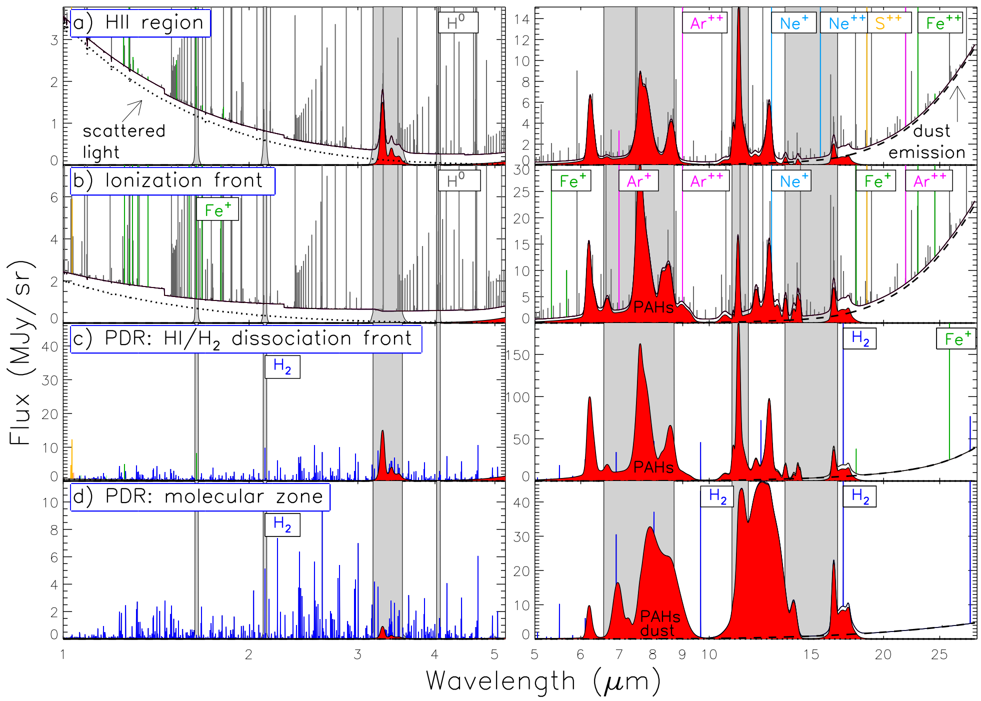

Figure 2: Model IR spectra of the 4 key regions within the interface of an H II region around a massive star (or cluster) and the natal molecular cloud (Fig. 1) illustrating the spectral richness that JWST will observe. Dust scattered light and continuum emission are shown in dotted and dashed lines. Ionic, atomic and molecular gas lines, PAHs and small dust bands are shown in colors. The band-passes of the photometric filters selected in this ERS program are shown in gray. Spectra have been calculated with the Meudon PDR code (Le Petit et al., ApJS, 2006), Cloudy (Ferland et al., PASP, 1998), DustEM (Compiégne et al., A&A, 2011) and PAHTAT (Pilleri et al., A&A, 2012).

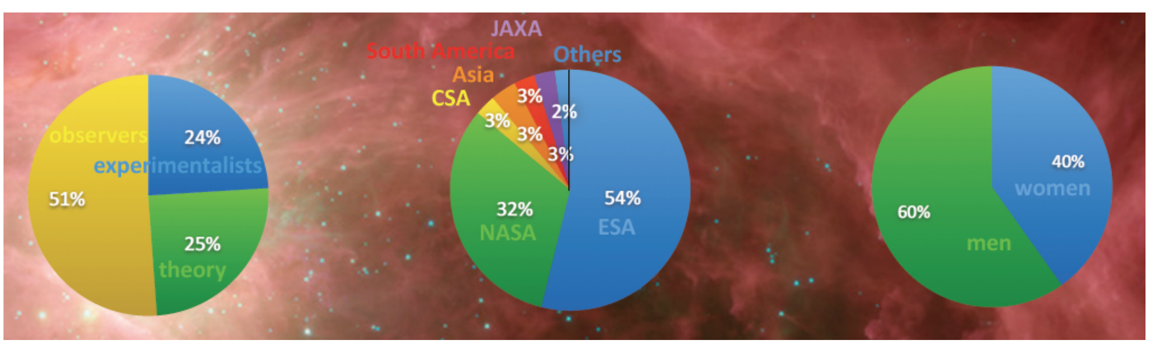

Figure 3: Detailed demographics of the ERS-PDR team.

The Observations

The current target (depending on JWST's launch date and thus the ERS window) is the archetypical nearby (d=414 pc) PDR, the Orion Bar. The observing modes are:

- **NIRSpec IFU moscaic:** 1–5.3 μm spectral map covering ∼27"x3" at a spectral resolution of ∼2700 and an angular resolution of 0.1"-0.2". The field of view (FOV) is positioned perpendicular to the PDR front to best trace the key zones in the PDR.

- **MIRI IFU mosaic:** 5-28.5 μm spectral map covering $\sim$27"x3" (similar as NIRSpec) at a spectral resolution of $\sim$1550–3250 and an angular resolution of 0.2" at 5 μm.
- **NIRCam imaging:** single pointing with the full array in bright mode for a 9.7 arcmin^2 FOV at an angular resolution of 0.1"–0.2" in the narrow and medium band filters 162M, 164N (probing [FeII] 1.64μm), 210M, 212N (probing H_2 1-0 S(1)), 300M, 335M (probing 3.3μm PAH band), and 405N, 410M (probing Brα), and the broadband filters 150W, and 444W.
- **MIRI imaging & NIRCAM parallel:** 3x3 mosaic with the SUB128 array for a $\sim$40"x40" FOV in the broad-band filters centered at 7.7, 11.3, 15, and 25.5 μm at an angular resolution of 0.2" at 5 μm.

The Science-Enabling Products

The program will provide the following products to the community:

- **P1 Enhanced data products:** i) maps of integrated lines/bands from IFU spectroscopy cubes; and ii) template spectra (H II region, ionization front, dissociation front, molecular zone) directly extracted from the observations or blind signal separation methods
- **P2 Products facilitating data reduction and manipulation:** i) spectral order stitching and stitched cubes; ii) cross-correlation of spectra & images; iii) pyPAHFIT to decompose the spectra into gas lines, dust features (aromatic/PAHs, aliphatics, fullerenes, silicates, ices), and dust continuum components (of all pixels in IFU maps); and iv) list of all the lines/bands present in the data
- **P3 Data-interpretation tools:** i) H_2 fitting tool for maps of T_{ex}, N_{H_2} and R_{otp}; ii) PDR model fitting tool for maps to search in massive grids of complete models and derive physical parameters from observations of any number of lines; iii) PAHdb Spectral Analysis Tool to decompose the PAH emission into contributing sub-populations (charge, size, composition, structure) using theoretical/laboratory IR cross section spectra from the NASA Ames PAH IR Spectroscopic Database; and iv) ionized gas lines diagnostic diagrams of key species for conversion of the lines intensities into physical conditions and extinction based on multi-level models or Cloudy.

Community Oriented Program

Telecons open to the community will be organized on a regular basis to disseminate data reduction, analysis techniques and recipes, best practices to design JWST proposals, and provided SEPs. We will organize the workshop "Galactic and extragalactic PDRs with JWST".

Join the team: https://jwst-ism.org

Abstracts

Probing the 9.7 µm interstellar silicate extinction profile through the *Spitzer*/IRS spectroscopy of OB stars

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The 9.7 µm interstellar spectral feature, arising from the Si–O stretch of amorphous silicate dust, is the strongest extinction feature in the infrared (IR). In principle, the spectral profile of this feature could allow one to diagnose the mineralogical composition of interstellar silicate material. However, observationally, the 9.7 µm interstellar silicate extinction profile is not well determined. Here we utilize the *Spitzer*/IRS spectra of five early-type (one O- and four B-type) stars and compare them with that of unreddened stars of the same spectral type to probe the interstellar extinction of silicate dust around 9.7 µm. We find that, while the silicate extinction profiles all peak at $\sim$9.7 µm, two stars exhibit a narrow feature of FWHM$\sim$2.0 µm and three stars display a broad feature of FWHM$\sim$3.0 µm. We also find that the width of the 9.7 µm extinction feature does not show any environmental dependence. With a FWHM of $\sim$2.2 µm, the mean 9.7 µm extinction profile, obtained by averaging over our five stars, closely resembles that of the prototypical diffuse interstellar medium along the lines of sight toward Cyg OB2 No. 12 and WR 98a. Finally, an analytical formula is presented to parameterize the interstellar extinction in the IR at 0.9 µm$\lesssim\lambda\lesssim 15$ µm.

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On the optical-to-silicate extinction ratio as a probe of the dust size in active galactic nuclei

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Dust plays a central role in the unification theory of active galactic nuclei (AGNs). Whether the dust that forms the torus around an AGN is tenth micron-sized like interstellar grains or much larger has a profound impact on correcting for the obscuration of the dust torus to recover the intrinsic spectrum and luminosity of the AGN. Here we show that the ratio of the optical extinction in the visual band (A_V) to the optical depth of the 9.7 µm silicate absorption feature ($\Delta\tau_{9.7}$) could potentially be an effective probe of the dust size. The anomalously lower ratio of $A_V/\Delta\tau_{9.7} \approx 5.5$ of AGNs compared to that of the Galactic diffuse interstellar medium of $A_V/\Delta\tau_{9.7} \approx 18$ reveals that the dust in AGN torus could be substantially larger than the interstellar grains of the Milky Way and of the Small Magellanic Cloud, and therefore, one might expect a flat extinction curve for AGNs.

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http://iopscience.iop.org/article/10.3847/1538-4357/aa6ba4/meta

Ion collision-induced chemistry in pure and mixed loosely bound clusters of coronene and C_{60} molecules

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Ionization, fragmentation and molecular growth have been studied in collisions of 22.5 keV He^{2+}- or 3 keV Ar^{+}-projectiles with pure loosely bound clusters of coronene ($C_{24}H_{12}$) molecules or with loosely bound mixed C_{60}-$C_{24}H_{12}$ clusters by means of mass spectrometry. The heavier and slower Ar^{+} projectiles induce prompt knockout-fragmentation – C- and/or H-losses – from individual molecules and highly efficient secondary molecular growth reactions before the clusters disintegrate on picosecond timescales. The lighter and faster He^{2+} projectiles have a higher charge and the main reactions are then ionization by ions that are not penetrating the clusters. This leads mostly to cluster fragmentation without molecular growth. However, also here penetrating collisions may lead to molecular growth but to a much smaller extent than with 3 keV Ar^{+}. Here we present fragmentation and molecular-growth mass distributions with 1 mass unit resolution, which reveals that the same numbers of C- and H-atoms often participates in the formation and breaking of covalent bonds inside the clusters. We find that masses close to those with integer numbers of intact coronene molecules, or with integer numbers of both

intact coronene and C_{60} molecules are formed where often one or several H-atoms are missing or have been added on. We also find that super-hydrogenated coronene is formed inside the clusters.

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http://pubs.rsc.org/en/content/articlelanding/2018/cp/c8cp01179f#!divAbstract

Anomalous microwave emission from spinning nanodiamonds around stars

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Several interstellar environments produce anomalous microwave emission (AME), with brightness peaks at tens-of-gigahertz frequencies. The emission's origins are uncertain; rapidly spinning nanoparticles could emit electric-dipole radiation, but the polycyclic aromatic hydrocarbons that have been proposed as the carrier are now found not to correlate with Galactic AME signals. The difficulty is in identifying co-spatial sources over long lines of sight. Here, we identify AME in three protoplanetary disks. These are the only known systems that host hydrogenated nanodiamonds, in contrast with the very common detection of polycyclic aromatic hydrocarbons. Using spectroscopy, the nanodiamonds are located close to the host stars, at physically well-constrained temperatures. Developing disk models, we reproduce the emission with diamonds 0.75-1.1 nm in radius, holding $\leq$1-2% of the carbon budget. Ratios of microwave emission to stellar luminosity are approximately constant, allowing nanodiamonds to be ubiquitous, but emitting below the detection threshold in many star systems. This result is compatible with the findings of similar-sized diamonds within Solar System meteorites. As nanodiamond spectral absorption is seen in interstellar sightlines, these particles are also a candidate for generating galaxy-scale AME.

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Photoinduced polycyclic aromatic hydrocarbon dehydrogenation: The competition between H- and H_2-loss

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Polycyclic aromatic hydrocarbons (PAHs) constitute a major component of the interstellar medium carbon budget, locking up to 10–20% of the elemental carbon. Sequential fragmentation induced by energetic photons leads to the formation of new species, including fullerenes. However, the exact chemical routes involved in this process remain largely unexplored. In this work, we focus on the first photofragmentation steps, which involve the dehydrogenation of these molecules. For this, we consider a multidisciplinary approach, taking into account the results from experiments, density functional theory (DFT) calculations, and modeling using dedicated Monte-Carlo simulations. By considering the simplest isomerization pathways — i.e., hydrogen roaming along the edges of the molecule — we are able to characterize the most likely photodissociation pathways for the molecules studied here. These comprise nine PAHs with clearly different structural properties. The formation of aliphatic-like side groups is found to be critical in the first fragmentation step and, furthermore, sets the balance of the competition between H- and H_2-loss. We show that the presence of trio hydrogens, especially in combination with bay regions in small PAHs plays an important part in the experimentally established variations in the odd-to-even H-atom loss ratios. In addition, we find that, as PAH size increases, H_2 formation becomes dominant, and sequential hydrogen loss only plays a marginal role. We also find disagreements between experiments and calculations for large, solo containing PAHs, which need to be accounted for. In order to match theoretical and experimental results, we have modified the energy barriers and restricted the H-hopping to tertiary atoms. The formation of H_2 in large PAHs upon irradiation appears to be the dominant fragmentation channel, suggesting an efficient formation path for molecular hydrogen in photodissociation regions (PDRs).

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A&A in press (2018)

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Molecular hydrogen formation on interstellar PAHs through Eley-Rideal abstraction reactions

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We present experimental data on H_2 formation processes on gas-phase polycyclic aromatic hydrocarbon (PAH) cations. This process was studied by exposing coronene radical cations, confined in a radio-frequency ion trap, to gas phase H atoms. Sequential attachment of up to 23 hydrogen atoms has been observed. Exposure to atomic D instead of H allows one to distinguish attachment from competing abstraction reactions, as the latter now leave a unique fingerprint in the measured mass spectra. Modeling of the experimental results using realistic cross sections and barriers for attachment and abstraction yield a 1:2 ratio of abstraction to attachment cross sections. The strong contribution of abstraction indicates that H_2 formation on interstellar PAH cations is an order of magnitude more relevant than previously thought.

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Photoinduced polycyclic aromatic hydrocarbon dehydrogenation: Molecular hydrogen formation in dense PDRs

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The physical and chemical conditions in photodissociation regions (PDRs) are largely determined by the influence of far ultraviolet radiation. Far-UV photons can efficiently dissociate molecular hydrogen, a process that must be balanced at the HI/H_2 interface of the PDR. Given that reactions involving hydrogen atoms in the gas phase are highly inefficient under interstellar conditions, H_2 formation models mostly rely on catalytic reactions on the surface of dust grains. Additionally, molecular hydrogen formation in polycyclic aromatic hydrocarbons (PAHs) through the Eley-Rideal mechanism has been considered as well, although it has been found to have low efficiency in PDR fronts. In a previous work, we have described the possibility of efficient H_2 release from medium to large sized PAHs upon photodissociation, with the exact branching

between H-/H_2-loss reactions being molecule dependent. Here we investigate the astrophysical relevance of this process, by using a model for the photofragmentation of PAHs under interstellar conditions. We focus on three PAHs cations (coronene, ovalene and circumcoronene), which represent three possibilities in the branching of atomic and molecular hydrogen losses. We find that, for ovalene (H_2-loss dominated) the rate coefficient for H_2 formation reaches values of the same order as H_2 formation in dust grains. This result suggests that this hitherto disregarded mechanism can account, at least partly, for the high level of molecular hydrogen formation in dense PDRs.

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A&A in press (2018)

http://adsabs.harvard.edu/abs/2018arXiv180602708C

The EDIBLES survey III. C_2-DIBs and their profiles

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An unambiguous identification of the carriers of the diffuse interstellar bands (DIBs) would provide important clues to the life cycle of interstellar matter. The so-called C_2-DIBs are a class of very weak bands that fall in the blue part of the optical spectrum and are associated with high column densities of the C_2 molecule. DIB profile structures constrain potential molecular carriers, but their measurement requires high signal-to-noise, high-resolution spectra and the use of sightlines without Doppler splitting, as typical for a single-cloud situation. Spectra from the ESO Diffuse Interstellar Bands Large Exploration Survey (EDIBLES) conducted at the Very Large Telescope (ESO/Paranal) were explored to identify single-cloud and high C_2 column sightlines, extract the corresponding C_2-DIBs and study their strengths and profiles, and to investigate in detail any sub-structures. The target selection was made based on profile-fitting of the 3303 and 5895 Å Na I doublets and the detection of C_2 lines. The C_2 (2-0) (8750-8849 Å) Phillips system was fitted using a physical model of the host cloud. C_2 column densities, temperatures as well as gas densities were derived for each sightline. Eighteen known C_2-DIBs and eight strong non-C_2 DIBs were extracted towards eight targets, comprising seven single-

cloud and one multi-cloud line-of-sights. Correlational studies revealed a tight association of the former group with the C_2 columns, whereas the non-C_2 DIBs are primarily correlated with reddening. We report three new weak diffuse band candidates at 4737.5, 5547.4 and 5769.8 Å. We show for the first time that at least 14 C_2-DIBs exhibit spectral sub-structures which are consistent with unresolved rotational branches of molecular carriers. The variability of their peak separations among the bands for a given sightline implies that their carriers are different molecules with quite different sizes. We also illustrate how profiles of the same DIB vary among targets and as a function of physical parameters and provide tables defining the sub-structures to be compared with future models and experimental results.

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https://arxiv.org/pdf/1805.11566.pdf
https://www.aanda.org/articles/aa/pdf/forth/aa33105-18.pdf

On the silicate crystallinities of oxygen-rich evolved stars and their mass loss rates

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For decades ever since the early detection in the 1990s of the emission spectral features of crystalline silicates in oxygen-rich evolved stars, there is a long-standing debate on whether the crystallinity of the silicate dust correlates with the stellar mass loss rate. To investigate the relation between the silicate crystallinities and the mass loss rates of evolved stars, we carry out a detailed analysis of 28 nearby oxygen-rich stars. We derive the mass loss rates of these sources by modeling their spectral energy distributions from the optical to the far infrared. Unlike previous studies in which the silicate crystallinity was often measured in terms of the crystalline-to-amorphous silicate mass ratio, we characterize the silicate crystallinities of these sources with the flux ratios of the emission features of crystalline silicates to that of amorphous silicates. This does not require the knowledge of the silicate dust temperatures which are the major source of uncertainties in estimating the crystalline-to-amorphous silicate mass ratio. With a Pearson correlation coefficient of $\sim$0.24, we find that the silicate crystallinities and the mass loss rates of these sources are not correlated. This supports the earlier findings that the dust shells of low mass-loss rate stars can contain a significant fraction of crystalline silicates without showing the characteristic features in their emission spectra.

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Spectral deconvolution of the 6196 and 6614 Å diffuse interstellar bands support a common-carrier origin

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We explore the common-carrier hypothesis for the 6196 and 6614 Å diffuse interstellar bands (DIBs). The observed DIB spectra are sharpened using a spectral deconvolution algorithm. This reveals finer spectral features that provide tighter constraints on candidate carriers. We analyze a deconvolved λ6614 DIB spectrum and derive spectroscopic constants that are then used to model the λ6196 spectra. The common-carrier spectroscopic constants enable quantitative fits to the contrasting λ6196 and λ6614 spectra from two sightlines. Highlights of our analysis include: (1) sharp cutoffs for the maximum values of the rotational quantum numbers, J_{max}=K_{max}, (2) the λ6614 DIB consists of a doublet and a red-tail component arising from different carriers, (3) the λ6614 doublet and λ6196 DIBs share a common-carrier, and (4) the contrasting shapes of the λ6614 doublet and λ6196 DIBs arise from different vibration-rotation Coriolis coupling constants that originate from transitions from a common ground state to different upper electronic state degenerate vibrational levels, and (5) the different widths of the two DIBs arise from different effective rotational temperatures associated with principal rotational axes that are parallel and perpendicular to the highest-order symmetry axis. The analysis results suggest a puckered oblate symmetric top carrier with a dipole moment aligned with the highest-order symmetry axis. An example candidate carrier consistent with these specifications is corannulene ($C_{20}H_{10}$), or one of its symmetric ionic or dehydrogenated forms, whose rotational constants are comparable to those obtained from spectral modeling of the DIB profiles.

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http://iopscience.iop.org/article/10.3847/1538-4357/aabd85/meta

Silicate dust in active galactic nuclei

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The unification theory of active galactic nuclei (AGNs) hypothesizes that all AGNs are surrounded by an anisotropic dust torus and are essentially the same objects but viewed from different angles. However, little is known about the dust that plays a central role in the unification theory. There are suggestions that the AGN dust extinction law appreciably differs from that of the Galaxy. Also, the silicate emission features observed in type 1 AGNs appear anomalous (i.e., their peak wavelengths and widths differ considerably from that of the Galaxy). In this work, we explore the dust properties of 147 AGNs of various types at redshifts $z < 0.5$, with special attention paid to 93 AGNs that exhibit the 9.7 and 18 µm silicate emission features. We model their silicate emission spectra obtained with the Infrared Spectrograph aboard the Spitzer Space Telescope. We find that 60/93 of the observed spectra can be well explained with "astronomical silicate", while the remaining sources favor amorphous olivine or pyroxene. Most notably, all sources require the dust to be micron-sized (with a typical size of $\sim$1.5 $\pm$ 0.1 µm), much larger than submicron-sized Galactic interstellar grains, implying a flat or "gray" extinction law for AGNs. We also find that, while the 9.7 µm emission feature arises predominantly from warm silicate dust of temperature T $\sim$270 K, the $\sim$5-8 µm continuum emission is mostly from carbon dust of T $\sim$640 K. Finally, the correlations between the dust properties (e.g., mass, temperature) and the AGN properties (e.g., luminosity, black hole mass) have also been investigated.

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A new technique for measuring polycyclic aromatic hydrocarbon emission in different environments

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We present a new method to decompose the emission features of polycyclic aromatic hydrocarbons (PAHs) from mid-infrared spectra using theoretical PAH templates in conjunction with modified blackbody components for the dust continuum and an extinction term. The primary goal is to obtain robust measurements of the PAH features, which are sensitive to the star formation rate, in a variety of extragalactic environments. We demonstrate the effectiveness of our technique, starting with the simplest Galactic high-latitude clouds to extragalactic systems of ever-increasing complexity, from normal star-forming galaxies to low-luminosity active galaxies, quasars, and heavily obscured infrared-luminous galaxies. In addition to providing accurate measurements of the PAH emission, including upper limits thereof, our fits can reproduce reasonably well the overall continuum shape and constrain the line-of-sight extinction. Our new PAH line flux measurements differ systematically and significantly from those of previous methods, by $\sim$15% to as much as a factor of ~ 6. The decomposed PAH spectra show remarkable similarity among different systems, suggesting a uniform set of conditions responsible for their excitation.

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First Circular

Cosmic Fullerenes Workshop

Orsay, September 19–21, 2018

Objective: Following the first Cosmic Fullerenes workshop in Edinburgh in 2017, we will be having a second edition of the workshop in Orsay nearby Paris, France. This workshop is intended to provide opportunities to discuss the status concerning the presence of fullerenes in space. In particular the goal is to bring together experimental, theoretical and observational researchers from the molecular astrophysics, chemistry and astronomy communities to discuss what is currently known about the topic and what our needs are to advance our understanding. This second workshop closely follows collaborative funding applications to forward our knowledge and understanding of the consequences of the presence of fullerenes in space for astrochemistry as quickly and efficiently as possible.

Dates & Times: Wed. Sep 19, 10:00 – Fri. Sep 21, 16:00

Location: The workshop will take place on the campus University Paris Sud, nearby Paris. The lectures will be given in the amphitheater Blandin at the Laboratoire de Physique des Solides.

Scientific Organizing Committee: Jan Cami (chair), Eleanor Campbell, Alain Omont, Thomas Pino

Local Organizing Committee: Thomas Pino (chair), Nathalie Ysard, Marin Chabot, Thomas Boutaréon, Emmanuel Dartois, Alain Omont, Elisabetta Micelotta

Preliminary Program: The workshop will consist of a mixture of tutorial lectures, short presentations (ca. 20 minutes), posters and discussion sessions. In particular, time will be set aside to discuss future potential collaborations, training networks and funding possibilities. Detailed scheduling will be confirmed close to the workshop time. Reviews will be given by invited speakers:

- Jan Cami (Western Ontario University): Interstellar & Circumstellar Fullerenes
- Ewen Campbell (Basel University): Experimental spectroscopy of fullerenes

- Chris Ewels (Nantes University): Formation of fullerenes
- Pat Fowler (Sheffield University): Structure and properties of fullerenes
- Henning Zettergren (Stockholm University): Dynamics of fullerenes

Important dates:
Registration ends on the 31st of August 2018
Abstract submission deadline (oral and poster): 15th of July 2018
Final program: beginning of September

Information: There will be no registration fee. Lunches and possibly dinners will be provided depending on financial support. Accommodation close to the campus, in the Orsay area, will be indicated in following letters.

To submit an abstract, send an email to **thomas.pino@u-psud.fr**

To register, please fill in the form: https://goo.gl/forms/DJSKWkqvVNkLVoA22

Symposium

"New Spectroscopic Techniques for Astrochemistry"

256th American Chemical Society National Meeting

August 19-23, 2018 – Boston, MA

The 256th American Chemical Society National Meeting, to be held from August 19-23 in Boston, MA, will feature a symposium on "New Spectroscopic Techniques for Astrochemistry" organized by Mike McCarthy and Kyle Crabtree. The symposium will feature talks on a wide variety of laboratory spectroscopic techniques used to investigate processes of interest to the field of astrochemistry across the electromagnetic spectrum and investigations of both gas-phase and condensed phase species, ranging from small molecules to PAHs. While laboratory spectroscopy is the primary focus, other talks on theory in support of spectroscopy and astronomical observations are scheduled. The **early registration deadline is July 9**, and the conference website with additional information about the meeting and a link to register is **https://www.acs.org/content/acs/en/meetings/national-meeting/registration.html**. The technical program will be posted to that website when it is available.

Meeting of the Laboratory Astrophysics Commission

XXXth General Assembly of the IAU
Monday August 27, 2018 – Vienna, Austria

http://astronomy2018.univie.ac.at/division-days/ddb/

Session 4b *parallel session 10:30 – 12:00*
Reports Commission B5 – Laboratory Astrophysics: from Obs. to Interpretation (Part 1)

- 10:30 – 11:00: Commission B5 Business Meeting – Farid Salama
  - *CB5 Triennial report and CB5 WG reports*
  - *OC Elections; Plans for the future, 2019 IAUS 350: Laboratory Astrophysics non-GA Symposium; Q&As*
- 11:00 – 11:20: Progress report of the Working Group Spectroscopic and Radiative Data for Molecules – Steve Federman
- 11:20 – 11:40: The ESO Diffuse Interstellar Band Large Exploration Survey: First Results – Jan Cami
- 11:40 – 12:00: The Virtual Atomic and Molecular Data Centre (VAMDC) A Resource for Atomic and Molecular Data – Marie-Lise Dubernet

Session 5b *parallel session 13:30 – 15:00*
Reports Commission B5 – Laboratory Astrophysics: from Obs. to Interpretation (Part 2)

- 13:30 – 13:50: A progress report of the Working Group High-Accuracy Stellar Spectroscopy – Tanya Ryabchikova
- 13:50 – 14:10: Searching for the sources of meteorites in the asteroid belt – Peter Jenniskens
- 14:10 – 14:30: Laboratory Astrophysics in the era of JWST – Stefanie Milam
- 14:30 – 14:50: Optical Properties of Organic Analogs to Cosmic Dust – Lisseth Gavilan
- 14:50 – 15:00: Open Discussion: Summary and Conclusions – All

IAU Commission B5 Laboratory Astrophysics:
https://www.iau.org/science/scientific_bodies/commissions/B5/

Announcements

Theory, experiment, and simulations in laboratory astrochemistry themed collection now online and currently free to access

We are delighted to announce that the Physical Chemistry Chemical Physics (PCCP) themed collection Theory, experiment, and simulations in laboratory astrochemistry is now online and free to access until the end of June 2018.

Guest-edited by Laurent Wiesenfeld (Universit Grenoble Alpes), Allan Shi-Chung Cheung (The University of Hong Kong) and Jos Oomens (Radboud University), this themed issue of PCCP overviews the recent developments showing physical insights in the areas of theory, experiment, and simulation as applied to molecular astrophysics environments.

Read the full collection online

It includes:

Editorial
Theory, experiment, and simulations in laboratory astrochemistry
Laurent Wiesenfeld, Jos Oomens and Allan S. C. Cheung
Phys. Chem. Chem. Phys., 2018, 20, 5341-5343. DOI: 10.1039/C8CP90026D

Perspective
Spectroscopy of prospective interstellar ions and radicals isolated in para-hydrogen matrices
Masashi Tsuge, Chih-Yu Tseng and Yuan-Pern Lee
Phys. Chem. Chem. Phys., 2018, 20, 5344-5358. DOI: 10.1039/C7CP05680J

Paper
A general method for the inclusion of radiation chemistry in astrochemical models
Christopher N. Shingledecker and Eric Herbst
Phys. Chem. Chem. Phys., 2018, 20, 5359-5367. DOI: 10.1039/C7CP05901A

Paper
Radiation chemistry of solid acetone in the interstellar medium a new dimension to an old problem
R. L. Hudson
Phys. Chem. Chem. Phys., 2018, 20, 5389-5398. DOI: 10.1039/C7CP06431D

Paper
Dissociative ionisation of adamantane: a combined theoretical and experimental study
Alessandra Candian, Jordy Bouwman, Patrick Hemberger, Andras Bodi and Alexander G. G. M. Tielens
Phys. Chem. Chem. Phys., 2018, 20, 5399-5406. DOI: 10.1039/C7CP05957D

AstroPAH Newsletter

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Next issue: 19 July 2017
Submission deadline: 6 July 2017