

## Statistical Overview on 2015 in Cyclodextrin Research and Technology

We announce the start of **Volume 30** of the CYCLODEXTRIN NEWS. This monthly periodical was established by Prof. József Szejtli (CycloLab) and Jim Paddington in 1987 with the aim of collecting all the cyclodextrin-related literature including papers, patents and conference presentations. This is the basis of the Cyclodextrin News database containing more than 60 000 issues in relation to cyclodextrins.

As usual we start the new volume of CYCLODEXTRIN NEWS with the evaluation of the last year's achievements in cyclodextrin research and technology.

Two important events of the year, the regional international conferences should be mentioned: the 6th Asian Cyclodextrin Conference (ACC2015) in Kumamoto (Japan) and 4th European Cyclodextrin Conference (EuroCD2015) in Lille (France) with more than 200 presentations all together.

Not only the large number of participants at these scientific meetings but also the continuously increasing number of publications including papers, patents and conference presentations shows the existing interest toward cyclodextrin research and development. Fig. 1 demonstrates how the number of publications increased using cumulative numbers of 5-year periods.

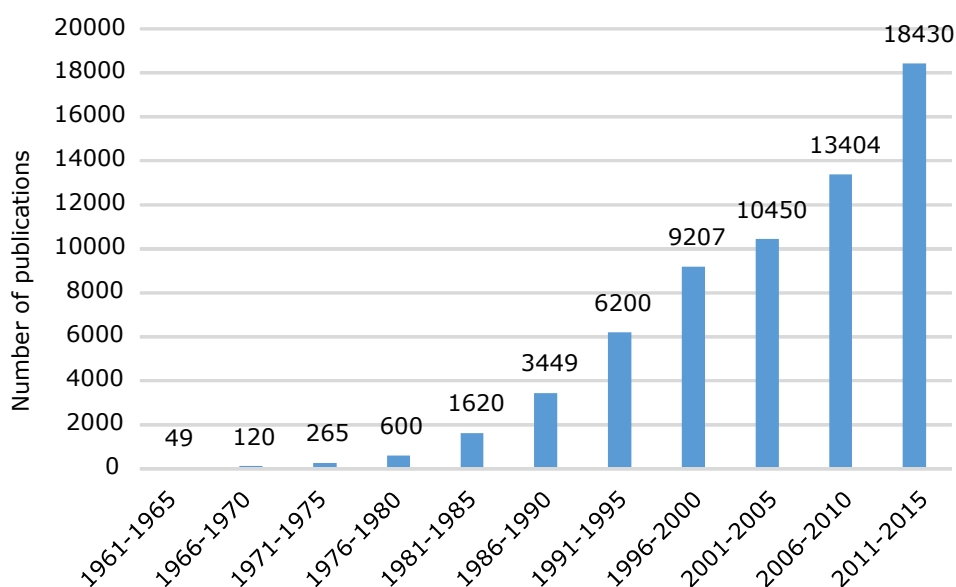
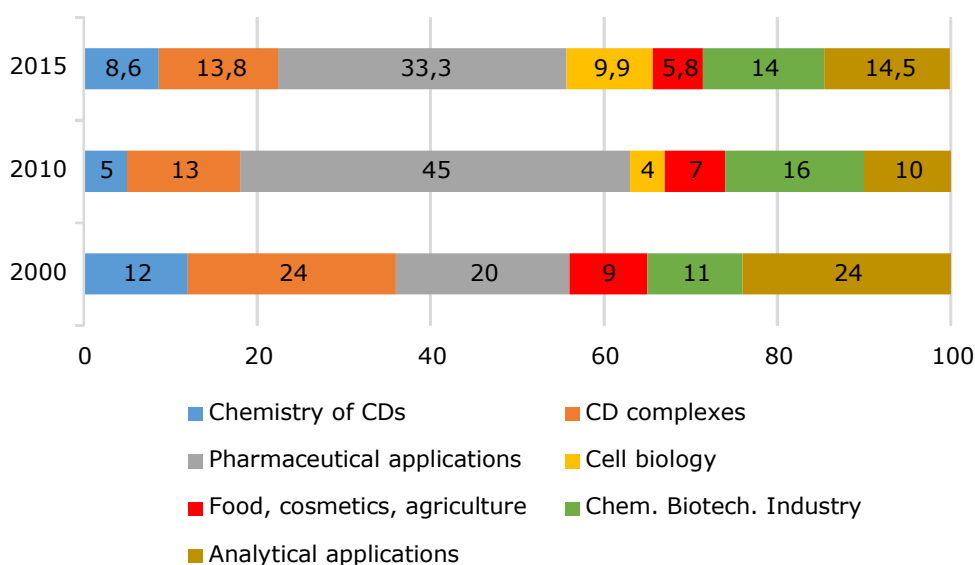


Fig. 1 Number of cyclodextrin-related publications (papers, patents and conference presentations)

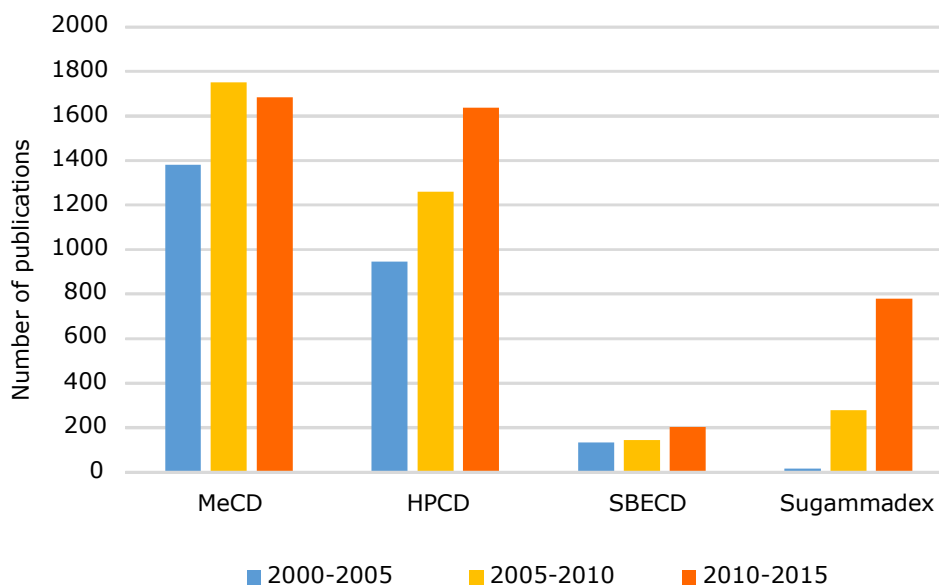
It is familiar to the readers of the CYCLODEXTRIN NEWS that the publications are classified into 7 topics. Fig. 2 compares 3 selected years (2000, 2010 and 2015) concerning the distribution of the publications in this classification system. The leading application is still the pharmaceutical, but the earlier growing increase seems to be broken and a slight decrease can be observed in the last 5 years. The 45% share in 2010 dropped to 33.3% in 2015. The analytical applications and those in the chemical, biotechnological industry are almost equally on the 2<sup>nd</sup> position (14.5% and 14%, resp.). The cyclodextrin chemistry (new derivatives, production of CDs, CGTase enzyme) and the theoretical studies of the inclusion complex formation together dropped from about 36% in 2000 to around 22% in 2010 and 2015. The studies on cell biology (effects on membrane, gene delivery, cellular mechanisms) is still a growing field (~10% in 2015), while the applications in food, cosmetic and agriculture are relatively less represented in the literature (~6%).



*Fig. 2 Distribution of the CD-related publications among the 7 main topics*

It is interesting which of the various CD derivatives are involved in the studies published in peer reviewed papers. A search in Scopus gave the results demonstrated in Fig. 3. The hydroxypropyl derivatives seem to overtake the methylated derivatives concerning the number of papers published in 2010-2015 period. Sugammadex shows an unexpected rise from 17 papers in 2000-2005 to 780 in 2010-2015. A slight increase can be observed in the number of papers on the sulfobutyl ether (SBE) derivatives.





*Fig. 3 Number of papers related to various CD derivatives*

In 2015 with an average of 4.5 papers and 2.5 patent applications daily the literature shows that cyclodextrin research and development is still in the focus. The editors of Cyclodextrin News will continue to collect and classify the literature for those who are interested.

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*Polyethylene glycol, Potassium phosphate*

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*Effects of substitutions, Commercial products*

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*Beta-cyclodextrin, Antioxidant, Nano-dispersion, V-Complex*

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*Oily fish, Anchovy oil/ $\beta$ -cyclodextrin complexes, PUFAs*

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*Palmitic acid, Oleic acid, Mimic of human milk fat, 1,3-Dioleoyl-2-palmitoylglycerol, Biocatalyst*

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*Leaching, Bioavailability, Mobility, Contaminated soil*

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*Aspects of computational/theoretical approach, Cyclodextrins, Green inhibitors*

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*Wastewater solution, Adsorption efficiency, Langmuir model*

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*Freundlich model, Adsorption capacity, Quantum chemical calculations*

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*Antibodies, Electrocatalytic activity,  $\beta$ -cyclodextrin functionalized graphene nanosheet, Host-guest interaction, Sandwich-type electrochemical immunosensor*

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*Chiral stationary phases, Unnatural amino acids*

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*Fluorescent probe, Semiconductors, Luminescence*

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