



## **Hyphenated techniques. Capabilities, state of the art and trends.**

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Analytical chemists are challenged by increasingly difficult tasks, including identification and quantitative determination of unknown components at trace level in complex samples. To combat such challenges the analytical techniques of high identification and separation potentials are needed. The tools combining both characteristics are hyphenated techniques, obtained by coupling two or more different techniques; most often one is to separate a mixture to single components and another to deliver information on identity of a species. Within this module coupling of gas chromatography (GC), liquid chromatography (LC) and capillary electrophoresis (CE), which are characterized by high separation power, with different spectrometric techniques will be critically discussed. Some coupled systems has been known and used for a long time, e.g. GC coupled with mass spectrometry (MS), which has been improved much. Many coupled systems, though invented long ago, advanced in last decades or even quite recently and are constantly improved also due to progress in other fields. The most widely used is GC coupled with MS equipped with different ionization sources. The high progress is observed now in MS with time of flight (TOF) mass analyzer, though TOF has been known for long time. Coupling LC with MS was much more difficult but with introduction of electrospray ionization started developing very fast. The other known techniques which will be discussed are separation techniques coupled with nuclear magnetic resonance (NMR), Fourier transform infrared (FTIR) spectrometry, atomic emission spectroscopy (AES). Many combinations of techniques have been based on inductively coupled plasma (ICP) applied to atomize molecules and ionize and excite atoms produced. Here are GC and LC-ICP-MS. Increasingly popular becomes tandem MS/MS being a part of many coupled systems. It is not easy to couple GC with NMR but progress is now noticeable. All these coupled systems will be discussed with many respects.

<b>TREMINY WYKŁADÓW</b>			
15.11.2010	Poniedziałek	14-17	LUWR (Chemia A)
16.11.2010	Wtorek	12-15	LUWR (Chemia A)
17.11.2010	Środa	12-15	LUWR (Chemia A)
18.11.2010	Czwartek	12-15	LUWR (Chemia A)
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