

# NEGYED ÉVSZÁZAD A LÉGKÖRI AEROSZOL-KUTATÁSBAN AZ MTA-PE LEVEGŐKÉMIAI KUTATÓCSOPORTJÁBAN

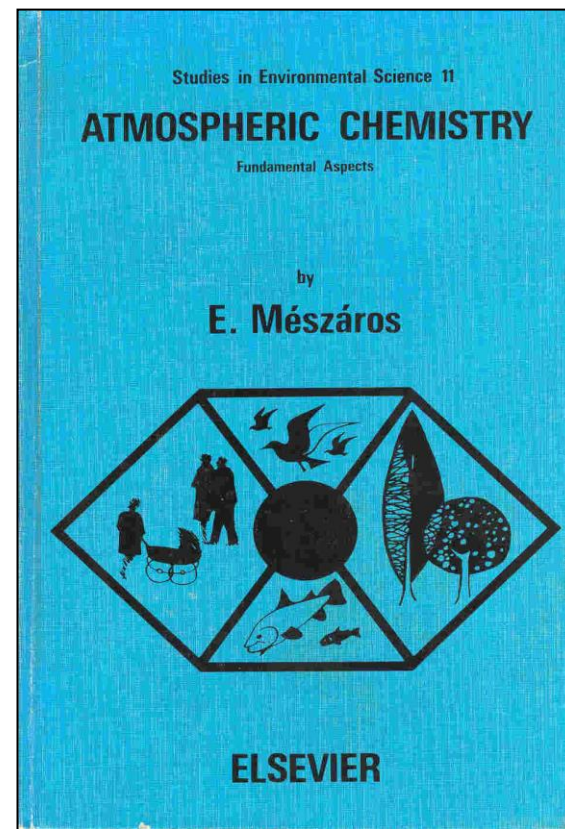


**GELENCSÉR ANDRÁS**  
**EGYETEMI TANÁR**



# A levegőkémiai kutatások bölcsőjétől...

- John Aitken (1880): "aeroszol részecskék nélkül nem lenne köd, nem lennének felhők és valószínűleg nem lenne csapadék sem"
- Junge (1963): kis ( $<1 \mu\text{m}$ ) vízoldható részecskék: kénsav,  $(\text{NH}_4)_2\text{SO}_4$ , NaCl
- **Mészáros (1968):** A  $0,1 \mu\text{m}$ -nél kisebb részecskék fontosak a felhőképződésben
- Twomey (1968): Valóban a legkisebb részecskék a fő felhőkondenzációs magvak



# ...a nagy sejtés

*Atmospheric Environment* Vol. 26A, No. 13, pp. 2469–2470  
Printed in Great Britain.

1992

0004–6981/92 \$5.00 + 0.00  
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## OPINION

### STRUCTURE OF CONTINENTAL CLOUDS BEFORE THE INDUSTRIAL ERA: A MYSTERY TO BE SOLVED

E. MÉSZÁROS

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**Abstract**—It follows from our present knowledge of cloud condensation nuclei (CCN) that practically the entire CCN population over the continents is of anthropogenic origin. If this conclusion is valid, the nature of continental CCN before the industrial era must be clarified.

*Key word index:* Cloud condensation nuclei, cloud structure, anthropogenic effects on clouds.

from gases of man-made origin. The last possibility is that past CCN were composed of organic materials emitted by natural sources. It is true that an important fraction of organic particulate matter is water-soluble (see Warneck, 1988, p. 322). However, their total amount is much less than that of sulfate ions. In addition these species are also not

# ...többen vitába szálltak vele

*Atmospheric Environment* Vol. 26A, No. 13, pp. 2471–2473, 1992.  
Printed in Great Britain.



## OPINION

### STRUCTURE OF CONTINENTAL CLOUDS BEFORE THE INDUSTRIAL ERA: A MYSTERY TO BE SOLVED\*

**Has Detective Mészáros been misled?** Has the scene of the crime been concealed? What if cloud condensation nuclei (CCN) were produced mainly in the free troposphere (FT) rather than in the atmospheric boundary layer (ABL)? By checking alibis, motives and opportunities, and by searching for other clues, can we solve Mészáros's mystery?

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# ...belépő a nemzetközi tudomány élvonalába

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## Large contribution of organic aerosols to cloud-condensation-nuclei concentrations

T. Novakov\* & J. E. Penner†

\* Energy and Environment Division, Lawrence Berkeley Laboratory, One Cyclotron Road, Berkeley, California 94720, USA


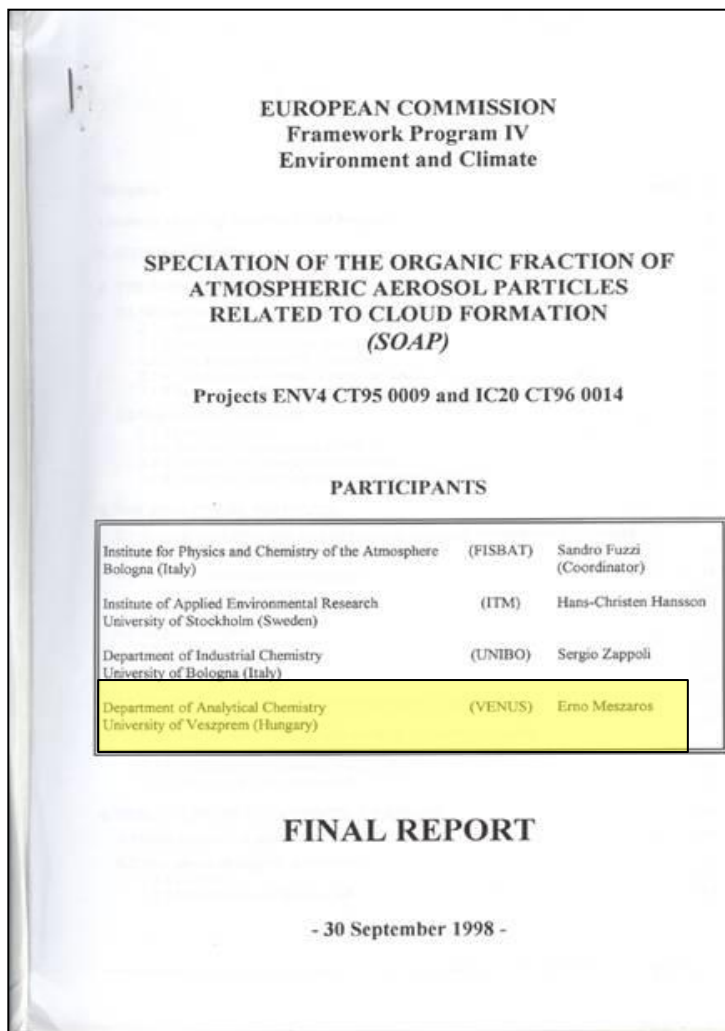
† Global Climate Research Division, Lawrence Livermore National Laboratory, PO Box 808, Livermore, California 94551, USA

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THE albedo and radiative properties of marine stratus clouds are determined largely by the number density of cloud condensation nuclei (CCN) over the oceans. Modelling studies have suggested that most of these nuclei are sulphate aerosols derived from both anthropogenic and natural sources<sup>1</sup>. Here we present evidence that organic aerosols also play a key role in cloud nucleation. We determine the relative contributions of sulphate and organic aerosols to CCN concentrations at a marine site known to be influenced by anthropogenic emissions, and find that organic aerosols account for the major part of both the total aerosol number concentration and the CCN fraction. Thus, in regions that are affected by anthropogenic pollutants, organic aerosols may play at least as important a role as sulphate aerosols in determining the climate effect of clouds.

*Nature, 1993*

# ...az első uniós projekt



PERGAMON



Atmospheric Environment 33 (1999) 2733–2743

## Inorganic, organic and macromolecular components of fine aerosol in different areas of Europe in relation to their water solubility

S. Zappoli<sup>a,\*</sup>, A. Andracchio<sup>a</sup>, S. Fuzzi<sup>b</sup>, M.C. Facchini<sup>b</sup>, A. Gelencsér<sup>c</sup>, G. Kiss<sup>c</sup>,  
Z. Krivácsy<sup>c</sup>, Á. Molnár<sup>c</sup>, E. Mészáros<sup>c</sup>, H.-C. Hansson<sup>d</sup>, K. Rosman<sup>d</sup>, Y. Zebühr<sup>d</sup>

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<sup>c</sup> Air Chemistry Group of the Hungarian Academy of Sciences, University of Veszprém, Egyetem 10, H-8200 Veszprém, Hungary  
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Received 21 October 1997; accepted 18 September 1998

### Abstract

A chemical mass balance of fine aerosol (<1.5 μm AED) collected at three European sites was performed with reference to the water solubility of the different aerosol classes of components. The sampling sites are characterised by different pollution conditions and aerosol loading in the air. Aspöreten is a background site in central Sweden, K-puszta is a rural site in the Great Hungarian Plain and San Pietro Capofiume is located in the polluted Po Valley, northern Italy. The average fine aerosol mass concentration was 5.9 μg m<sup>-3</sup> at the background site Aspöreten, 24 μg m<sup>-3</sup> at the rural K-puszta and 38 μg m<sup>-3</sup> at the polluted site San Pietro Capofiume. However, a similarly high soluble fraction of the aerosol (65–75%) was measured at the three sites, while the percentage of water soluble organic species with respect to the total soluble mass was much higher at the background site (ca. 50%) than at the other two sites (ca. 25%). A very high fraction (over 70%) of organic compounds in the aerosol consisted of polar species. The presence of water soluble macromolecular compounds was revealed in the samples from K-puszta and San Pietro Capofiume. At both sites these species accounted for between ca. 20–50% of the water soluble organic fraction. The origin of the compounds was tentatively attributed to biomass combustion. © 1999 Elsevier Science Ltd. All rights reserved.

**Keywords:** Aerosol chemistry; Organic aerosol; Water soluble organic compounds; Macromolecular compounds

# ...meglepő új felismerések

 *Journal of Atmospheric Chemistry* 45: 25–33, 2003.  
© 2003 Kluwer Academic Publishers. Printed in the Netherlands.

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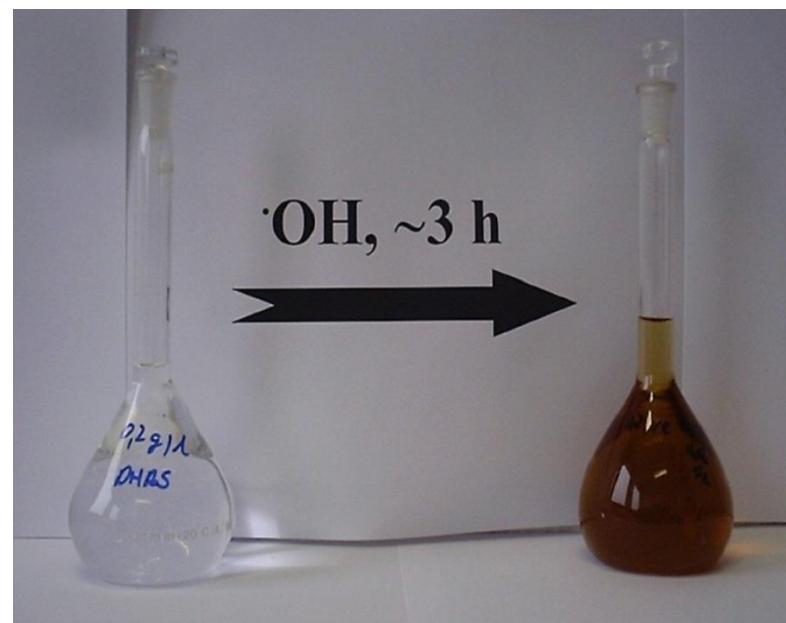
## *In-situ* Formation of Light-Absorbing Organic Matter in Cloud Water

A. GELENCSÉR<sup>1</sup>, A. HOFFER<sup>2</sup>, G. KISS<sup>1</sup>, E. TOMBÁ CZ<sup>3</sup>, R. KURDI<sup>4</sup> and L. BENCZE<sup>4</sup>

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<sup>2</sup>Department of Earth and Environmental Sciences, University of Veszprém, Egyetem u. 10, H-8200 Veszprém, Hungary

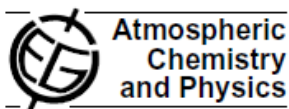
Kismolekulájú szerves vegyületekből  
felhővízben  
humuszszerű vegyületek (HULIS)  
képződhetnek → ‘brown carbon’



# ...globális jelentőségűek

## Brown carbon

Atmos. Chem. Phys., 6, 3131–3148, 2006  
www.atmos-chem-phys.net/6/3131/2006/  
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under a Creative Commons License.



### Black carbon or brown carbon? The nature of light-absorbing carbonaceous aerosols

M. O. Andreae<sup>1</sup> and A. Gelencsér<sup>2</sup>

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<sup>2</sup>Air Chemistry Group of the Hungarian Academy of Sciences, University of Veszprém, P.O. Box 158, H-8201 Veszprém, Hungary

Atmos. Chem. Phys., 16, 239–246, 2016  
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doi:10.5194/acp-16-239-2016  
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Atmospheric  
Chemistry  
and Physics  
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### Light absorption properties of laboratory-generated tar ball particles

A. Hoffer<sup>1</sup>, A. Tóth<sup>2</sup>, I. Nyirő-Kósa<sup>1</sup>, M. Pósfai<sup>2</sup>, and A. Gelencsér<sup>1,2</sup>

<sup>1</sup>MTA-PE Air Chemistry Research Group, Veszprém, P.O. Box 158, 8201, Hungary

<sup>2</sup>Department of Earth and Environmental Sciences, University of Pannonia, Veszprém, P.O. Box 158, 8201, Hungary

## Atmospheric Brown Clouds: From Local Air Pollution to Climate Change

Guenter Engling<sup>1</sup> and András Gelencsér<sup>2</sup>

1811-5209/10/0006-0223\$2.50 DOI: 10.2113/gselements.6.4.223

**A**tmospheric brown clouds are atmospheric accumulations of carbonaceous aerosol particles spanning vast areas of the globe. They have recently gained much attention, from the scientific community and from the general population, as they severely impact several aspects of everyday life. Aside from affecting regional air quality and negatively impacting human health, these clouds affect biogeochemical cycles and profoundly influence the radiation budget of the Earth, resulting in severe climatic and economic consequences. Carbonaceous aerosol particles are generated primarily by combustion processes, including biomass and fossil fuel burning. Natural emissions and transformations of volatile organic

fast growing air vehicle fleets in urban areas.

Although ABC the globe, they in Asia, Africa, Some of the m have been obsc Asia and the Ocean (Fig. 1), for long period per year) and

Atmos. Chem. Phys., 14, 1–7, 2014  
www.atmos-chem-phys.net/14/1/2014/  
doi:10.5194/acp-14-1-2014  
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Atmospheric  
Chemistry  
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### Atmospheric tar balls: aged primary droplets from biomass burning?

A. Tóth<sup>1</sup>, A. Hoffer<sup>2</sup>, I. Nyirő-Kósa<sup>2</sup>, M. Pósfai<sup>1</sup>, and A. Gelencsér<sup>1,2</sup>

<sup>1</sup>Department of Earth and Environmental Sciences, University of Pannonia, Veszprém, P.O. Box 158, 8201, Hungary

<sup>2</sup>MTA-PE Air Chemistry Research Group, Veszprém, P.O. Box 158, 8201, Hungary



# ...nemzetközi elismerések

## Evidence of visible light absorption by organic carbon



### Andreae and Gelencser, 2006

Brown carbon: Light-absorbing organic matter in atmospheric aerosols of various origins – soil humics, HULIS, tarry materials from combustion, bioaerosols

### Patterson and McMahon, 1984 and Bond, 2001

Observed smoldering material and residential coal combustion can contain large amounts of  $C_{\text{brown}}$

### Kirchstetter et al, 2004

Demonstrated an OC contribution to spectral light absorption for several biomass from SAFARI – same technique used in this study

### Hoffer et al., 2005, Havers et al., 1998, Gelencser et al. 2000 and others

Fine continental aerosol contains organic carbon with properties similar to natural humic/fulvic substances.

### Andreae and Crutzen, 1997

Biogenic materials and their oxidation and polymerization products can absorb light

# ...kitérőkkel




## The Red Mud Accident in Ajka (Hungary): Characterization and Potential Health Effects of Fugitive Dust

András Gelencsér,<sup>†</sup> Nóra Kovács,<sup>†</sup> Beatrix Turóczy,<sup>†</sup> Ágnes Rostási,<sup>†</sup> András Hoffer,<sup>†</sup> Kornélia Imre,<sup>†</sup> Ilona Nyirő-Kósa,<sup>†</sup> Dorottya Csákberényi-Malasics,<sup>†</sup> Adam Tóth,<sup>†</sup> Aladár Czitrovszky,<sup>§</sup> Attila Nagy,<sup>§</sup> Szabolcs Nagy,<sup>†</sup> András Ács,<sup>†</sup> Anikó Kovács,<sup>†</sup> Árpád Ferincz,<sup>†</sup> Zsuzsanna Hartyáni,<sup>†</sup> and Mihály Pósfai<sup>\*†</sup>

<sup>†</sup>University of Pannonia, Veszprém, Hungary

<sup>†</sup>Air Chemistry Group of the Hungarian Academy of Sciences, Veszprém, Hungary

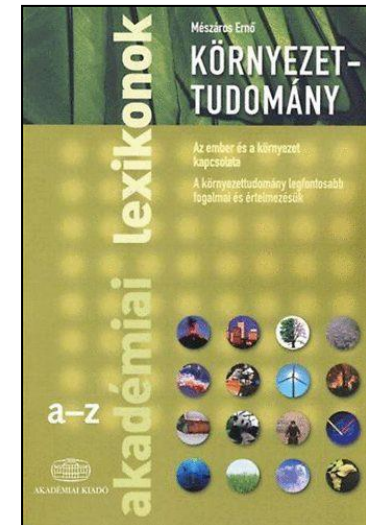
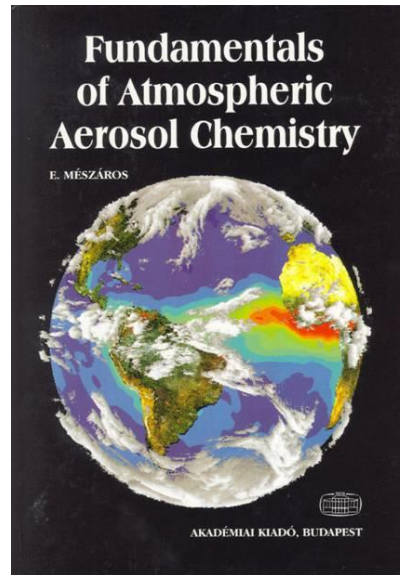
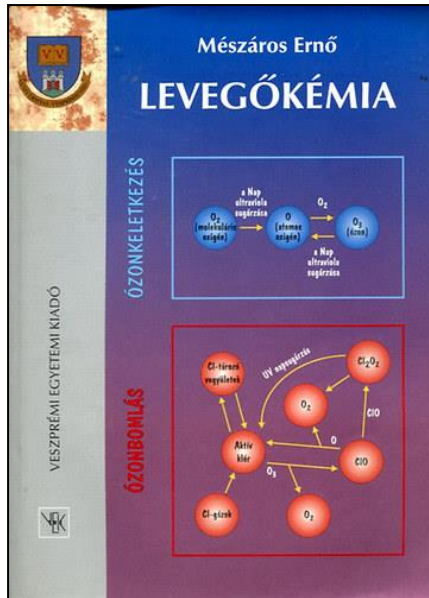
<sup>§</sup>Research Institute for Solid State Physics and Optics, Hungarian Academy of Sciences, Budapest, Hungary

 Supporting Information

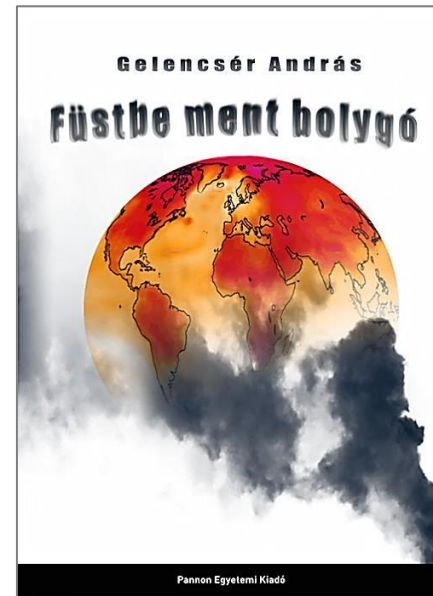
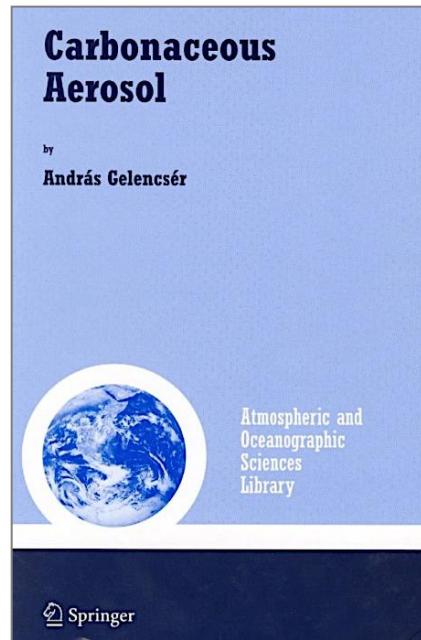
**ABSTRACT:** As a result of a tragic industrial accident, a highly alkaline red mud sludge inundated settlements and agricultural areas near Ajka, Hungary on October 4, 2010. One of the major concerns about the aftermaths of the accident is the potential health effects of vast amounts of fugitive dust from red mud sediment. Thus, we studied the chemical and physical properties of particles of red mud and its respirable fugitive dust, and performed toxicity measurements. Under unfavorable meteorological conditions dry red mud sediment could emit very high amounts of respirable alkaline particles into the air. The number size distribution of fugitive dust peaks above 1  $\mu\text{m}$  aerodynamic diameter; therefore, its inhalation is unlikely to affect the deep regions of the lungs. No significant mineralogical or elemental fractionation was observed between the sediment and dust, with the major minerals being hematite, cancrinite, calcite, and hydrogarnet. Although the high resuspension potential and alkalinity might pose some problems such as the irritation of the upper respiratory tract and eyes, based on its size distribution and composition red mud dust appears to be less hazardous to human health than urban particulate matter.



# Tudomány – oktatás – ismeretterjesztés



# ...a továbbvitt örökség



# ...társadalmilag hasznos kutatások

<https://doi.org/10.5194/acp-2020-672>  
Preprint. Discussion started: 17 July 2020  
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Atmospheric  
Chemistry  
and Physics  
Discussions



## Emission factors for PM<sub>10</sub> and PAHs from illegal burning of different types of municipal waste in households

András Hoffer<sup>1</sup>, Beatrix Jancsek-Turóczy<sup>2</sup>, Ádám Tóth<sup>2</sup>, Gyula Kiss<sup>1,2</sup>, Anca Naghiu<sup>3</sup>, Erika Andrea Levei<sup>3</sup>, Luminita Marmureanu<sup>4</sup>, Attila Machon<sup>5</sup>, András Gelencsér<sup>1,2</sup>

The screenshot shows a news article on the hvg.hu website. The main image depicts a person standing in a large pile of burning municipal waste, with thick smoke rising from the fire. The article title is "Brutális mennyiségű mérgező, rákkeltő anyag kerül a szervezetünkbe, ha hulladékot égetünk". The text below the title states: "Ha műanyag-jellegű hulladékot, így PET-palackot, vagy akár ruhát égetünk, akár ezerszer több mérgező anyag kerül a levegőbe, mintha tűzifát égetnénk. De a fajlegű hulladékok, így a papír égetése is harmincszor rákkeltőbb a száraz fa égetésénél."

hvg.hu

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2020. július 20. 11:12 · Utolsó frissítés: 2020. július 20. 12:12 · ZHVG

**Brutális mennyiségű mérgező, rákkeltő anyag kerül a szervezetünkbe, ha hulladékot égetünk**

szerző:  
hvg.hu

344  
Ajánlom

34

An aerial photograph of a city at sunset. The sky is a mix of blue and orange, and the city lights are visible in the distance. The text "Köszönöm a figyelmet!" is overlaid in the bottom right corner.

**Köszönöm a figyelmet!**