# Proposal and Attendance Form for NSTX Research Forum 2001

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**Please write in the boxes below a one-page abstract of your proposal to be presented:**

**Title:** Hydrogen retention and release at graphite and carbon composits


**Abstract**:

*2000 Results.*

In the paper the amount of hydrogen retained in the graphite of different type was measured with help of Thermal Desorption Spectrometry (TDS). The following materials were investigated.

- Fine grain graphite of MPG-8 type
- Fine grain graphite of MPG-8 type subjected to $H_5^+$ ion bombardment simultaneously with irradiation by the flow of the W atoms. At the surface of the MPG-8(W) after such treatment the cone like structure was developed. The mean heights of the cones were ≈0.5 μm. The base diameters were ≈0.15 μm.
- The Carbon Fiber Composite (PAN fibers, SNECMA, France).
- Boron Carbide deposited at the MPG-8

The samples were bombarded in the hydrogen discharge with ion flow including mainly $H_5^+$ ions. Ion energy – 200 eV, the ion current density – $2\times10^{19}$ $m^{-2}s^{-1}$. Irradiating doses were $4\times10^{22}$, $2\times10^{24}$ $m^{-2}$. Temperature of irradiation was equal to 350÷380ºC.

The experimental results can be summarized as follows.

The thermal desorption from the all investigated materials increase very weakly after reaching the irradiation dose equals $\approx4\times10^{23}$ $m^{-2}$.

The full amount of retained hydrogen reaches $\approx(2.5\div2.8)\times10^{21}$ $m^{-2}$ for MPG-8, MPG-8(W), CFC and $\approx(0.7\div0.8)\times10^{21}$ $m^{-2}$ for $B_4C$ when samples was irradiated with doses $2\times10^{23}\div2\times10^{24}$ $m^{-2}$.

The main TDS peaks for all investigated materials situate near 650ºC for $CH_4$ molecules and near 1000ºC for $H_2$ molecules.

The amount of hydrogen desorbing in content of $CH_4$ molecules exceeds hydrogen desorption approximately in 3.8; 3.5; 2.1 and 0.9 times, accordingly for MPG-8, MPG-8(W) CFC and $B_4C$, irradiated with dose $2\times10^{24}$ $m^{-2}$.

Thermal desorption of both the $H_2$ and $CH_4$ molecules are quite similar for MPG-8 and MPG-8(W) surfaces despite great difference in the surface area.

The amount of hydrogen remained in the $B_4C$, MPG-8, MPG-8(W) and CFC samples at the temperature range T>800ºC (after $CH_4$ desorption) relates as 1:1.3:1.5:2.1.

*2001-2002 Research Program.*

In 2001-2002 we are planning to perform the detailed investigation of the hydrogen isotopes retention and release as well as the erosion properties of the graphite materials in conditions

simulating conditions at the first wall and divertor.
The following materials will be investigated.

1. CFC after modification under long term plasma bombardment. (Formation of the dense uniform layers was investigated recently at the surface of the CFC tiles subjected to the plasma irradiation during long discharges in Tore Supra [unpublished results])
2. CFC subjected to simultaneous irradiation by hydrogen and tungsten atomic particles.
3. Crystalline $B_4C$ coating deposited in the plasma discharge.

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| Choose only one topical session by inserting X for each proposal<br>(Use separate forms for separate proposals) | **2000 Results** (mbell@pppl.gov)<br>**& 2001 Research Program** (esynakowski@pppl.gov)<br>(Please submit by January 10, 2001)<br>__ET1: Macroscopic Stability<br>__ET2: Transport & Turbulence<br>__ET3: High Harmonic Fast Wave & Electron Bernstein Wave<br>__ET4: Coaxial Helicity Injection<br>X_ET5: Boundary Physics<br>**2002-2005 Research Opportunities** (mpeng@pppl.gov)<br>(Please submit by January 11, 2001)<br>__TG1: Noninductive Startup<br>__TG2: Heating, Current Drive & Fueling<br>__TG3: Macroscopic Stability<br>__TG4: Transport & Turbulence<br>__TG5: Energetic Particle Physics<br>__TG6: Multiphase Interface (Boundary Physics)<br>**Fluctuations Measurement** (esynakowski@pppl.gov)<br>(Please submit by January 10, 2001)<br>__Fluctuations Measurement proposals |

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**Special Requests for your proposal (projector type, time constraints, etc.):**

Please return this document via e-mail attachment to jrobinson@pppl.gov, jsavino@pppl.gov, and the corresponding organizer listed above. Please e-mail questions or comments to the organizers listed above.