ODMR OF ATOMS TRAPPED IN IMPURITY-HELIUM SOLID. [a]

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Metastable N(^{2}D) atoms are stabilized in an aerogel-like medium, soaked by superfluid helium (HeII), and called Impurity-Helium Solid (IHS), showing strong thermoluminescence in the range of 1.4 to 4.0 K on the ^{2}D-^{4}S transition (523 nm). Even slight increase in temperature (less than 100 mK) leads to significant rise in luminescence. We used IHS as a specific optical bolometer for monitoring of magnetic resonance (ODMR) of paramagnetic atoms, trapped in IHS and detected for the first time ODMR of ground state N(^{4}S) atoms upon CW microwave incident on the sample and slow sweep of magnetic field. On passing through resonance the sample absorbed microwave radiation and, as a result of spin-lattice relaxation was heated large enough for excitation of luminescence and optical detection of magnetic resonance.

Recently we have managed to excite blue luminescence of Kr- and Ar- IHS samples, containing diluted amounts of atomic nitrogen by applying a short heat pulses to the sample directly in HeII. The observed luminescence was found to decay at λ 427 nm with characteristic time τ less than 10 msec. We have been improving the sensitivity of this ODMR approach by employing a pulsed microwave radiation with subsequent synchronous detection of luminescence.

The method proposed is expected to be universal for optical monitoring of magnetic resonance of any paramagnetic species, trapped in IHS due to non-specific nature of excitation of luminescence.

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