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**New phase diagram of ideally flat $CuO_2$ plane: Cu-NMR study in Five-layered Cuprates** HIDEKAZU MUKUDA, Osaka University, MACHIKO ABE, SUNAO SHIMIZU, YOSHIO KITAOKA, AKIRA IYO, HIJIRI KITO, YASUMOTO TANAKA, YASUHARU KODAMA, KAZUYASU TOKIWA, TSUNEO WATANABE, OSAKA UNIVERSITY TEAM, NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST) TEAM, TOKYO UNIVERSITY OF SCIENCE TEAM — We report a systematic Cu-NMR study on Hg-, Tl-,Cu-based five-layered high-Tc cuprates. In underdoped $HgBa_2Ca_4Cu_5O_y$ (Hg-1245) with a Tc=72 K, the AFM order is detected with $0.1\mu_B$ even at two outer planes (OP's) that are responsible for the onset of superconductivity (SC). This is the first microscopic evidence for the uniform mixed phase of AF and SC on a single $CuO_2$ [1]. Recently we found AFM insulating state at low temperatures in disordered fivelayered cuprate Cu-1245, whereas the carrier densities are similar to Hg-1245(OPT) where the AFM metallic state are realized in IP's[2]. This finding reinforces the phase diagram in which the AFM metallic phase exists between AFM insulator and SC states for the case of ideally-flat $CuO_2$ plane without disorder. [1] Mukuda et al., Phys. Rev. Lett. 96,087001 (2006) [2] Mukuda et al., J. Phys. Soc. Jpn., 75, No.12 (2006)

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