STORAGE OF INFORMATION USING SMALL ORGANIC MOLECULES

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Digital information grows exponentially, while societal requirements and individual desires to store it for long times do not subside. Current technology creates an increasingly large burden in power consumption and other efforts required to keep information intact over long periods of time at low cost (e.g., spinning hard disks in idle, refrigerating and copying magnetic tapes every few years). We have developed a fundamentally new concept to store digital information, using mixtures of small molecules. The presence or absence of a readily available, stable, low-molecular-weight organic compound (MolBit) in a mixture indicates a "1" or "0" in a string of binary digits, and a molecular property (e.g., mass) determines the sequence of information. The mixtures are stored as arrayed spots on metallic or polymeric surfaces. Using a library of 32 oligopeptides for a demonstration, we have encoded, written, stored, and read a total of approximately 400 kilobits (with greater than 99% recovery of information, written at 8 bits/s, read at 20 bits/s). We project that MolBits are as stable as, but 10^6-fold more efficient in cost and writing speed than DNA-based storage and can plausibly be scaled to write terabytes per day.