

Multimodal Probes for Molecular Imaging

Introduction

The conundrum of modality selection in clinical diagnostic imaging is that modalities with the highest sensitivity have relatively poor resolution, while those with high resolution have relatively poor sensitivity. In recent years, the idea of using multiple modalities in conjunction has gained in popularity and researchers have come to realize that the complementary abilities of different imaging modalities could be harnessed to great effect by using them in tandem. The idea of combining imaging technologies moved to the mainstream with the advent of the first successful commercial fused instruments. The first fused PET/CT instrument, developed in 1998 by Townsend and colleagues in collaboration with Siemens Medical, was available commercially in 2001. Over the ensuing years PET/CT sales increased with such vigor that by the year 2006 there were virtually no sales of standalone PET instruments; all PET sales were as part of multimodality systems. Now PET/MRI instruments are poised to enter the clinic. With hybrid technology clearly on the rise, the excitement over these new instruments has triggered a tumult of activity in probe design and development in an effort to boost the clinical benefits of hybrid instrument technology. In this talk I present an overview of approaches to develop multimodal probes using current projects in my laboratory as examples. Activatable probes, multimodal quantum dots, and PET/MR imaging of inflamed plaques are discussed.